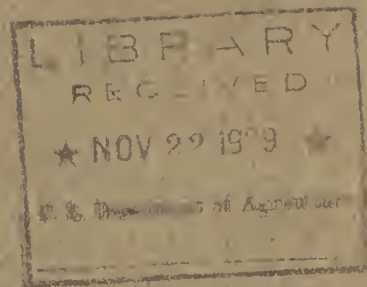


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VOLUME NO. 1

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EXPERIMENT STATIONS
EXTENSION SERVICE

WEATHER BUREAU
BUREAU OF ANIMAL INDUSTRY
BUREAU OF DAIRY INDUSTRY
BUREAU OF PLANT INDUSTRY
FOREST SERVICE

—oO—

EXPLANATORY NOTES

OF

INCREASES, DECREASES, AND CHANGES IN LANGUAGE

IN THE BUDGET FOR THE

DEPARTMENT OF AGRICULTURE

FOR THE

FISCAL YEAR ENDING JUNE 30, 1931

AND OF

WORK DONE UNDER EACH OF THE APPROPRIATION ITEMS.

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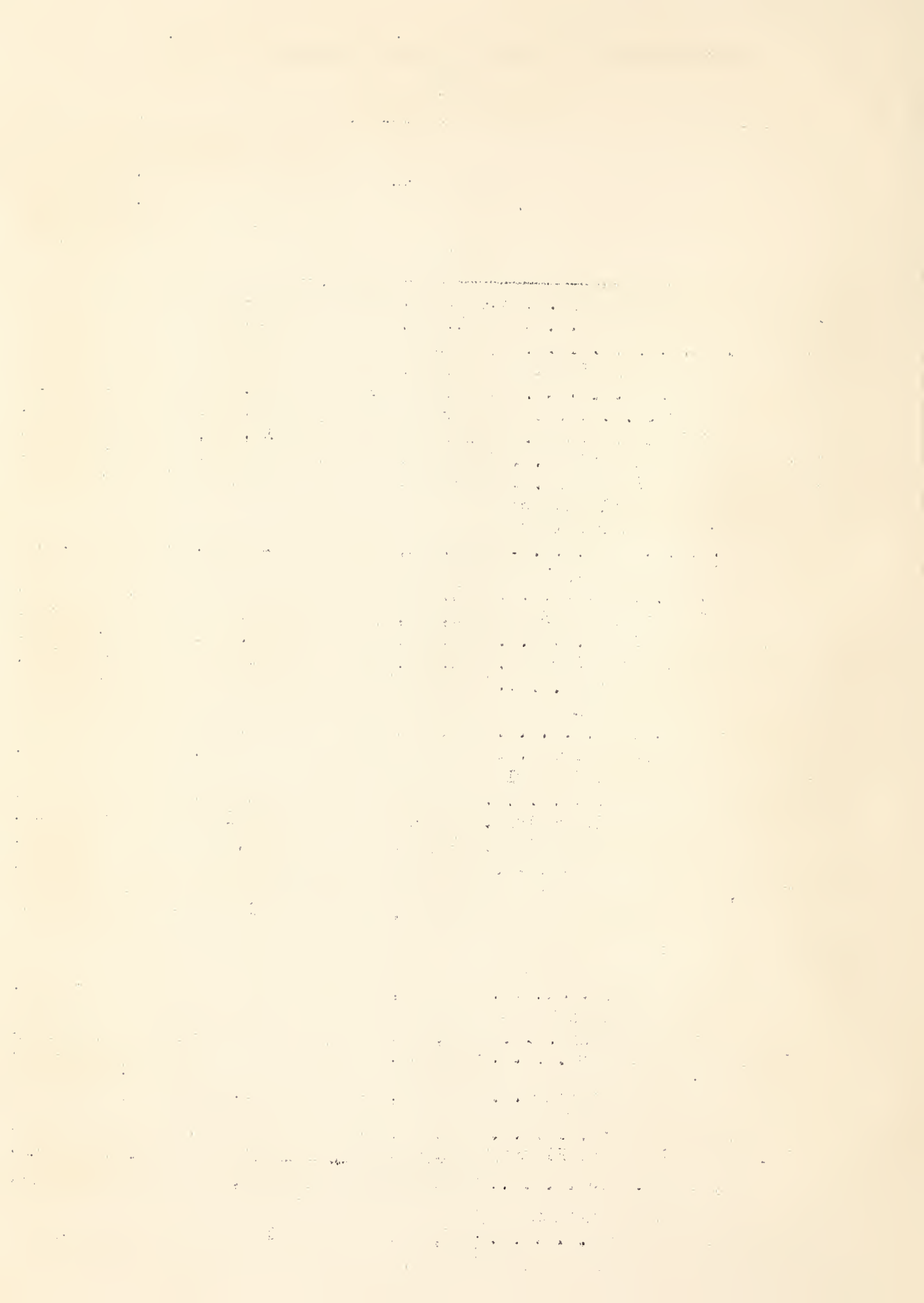
DEPARTMENT OF AGRICULTURE
FINANCIAL STATEMENT OF APPROPRIATIONS
for 1930 and 1931
SHOWING SUMMARY BY BUREAUS
AND DETAIL BY SUBAPPROPRIATIONS
(Pages 5 to 19, inclusive)

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Appropriations for 1930 and Budget Allowances for 1931

SUMMARY BY BUREAUS

Bureau	Available 1930	Budget Allowance, 1931	
		Amount	Increase or decrease com- pared with 1930
Office of the Secretary . . .	\$ 1,180,390	\$ 1,137,000	- \$ 43,390
Office of Information . . .	1,242,000	1,352,000	+ 110,000
Library	102,000	105,000	+ 3,000
Office of Experiment Stations	4,737,000	4,758,000	+ 21,000
Extension Service	9,416,551	9,427,936	+ 11,385
Weather Bureau	3,450,400	4,106,400	+ 656,000
Bureau of Animal Industry .	15,502,870	15,577,400	+ 74,530
Bureau of Dairy Industry . .	649,800	669,300	+ 19,500
Bureau of Plant Industry . .	4,967,843	5,325,860	+ 358,017
Forest Service (exclusive of forest roads and receipts funds)	13,024,280	15,743,730	+ 2,719,450
Forest Service receipts funds	3,445,500	4,015,500	+ 570,000
Bureau of Chemistry and Soils	1,655,075	1,824,140	+ 169,065
Bureau of Entomology	2,197,178	2,465,620	+ 268,442
Bureau of Biological Survey .	1,670,982	1,779,520	+ 108,538
Bureau of Public Roads	495,400	600,400	+ 105,000
Bureau of Agricultural Economics	6,047,660	6,238,300	+ 190,640
Bureau of Home Economics . .	167,500	207,700	+ 40,200
Plant Quarantine and Control Administration	3,256,665	3,698,800	+ 442,135
Grain Futures Administration .	140,000	155,000	+ 15,000
Food and Drug Administration .	1,537,300	1,596,000	+ 58,700
Miscellaneous Items	670,243	614,900	- 55,343
Total, General Activities (All Foregoing Items)	75,556,637	81,398,506	+ 5,841,869
Special Items:			
Loans to farmers in south- eastern States	375,000	-	- 375,000
Preventing spread of Medi- terranean fruit fly	3,035,000	-	- 3,035,000
Total, Special Items	3,410,000	-	- 3,410,000
Road Funds:			
Forest roads and trails . . .	8,000,000	7,500,000	- 500,000
Cooperative construction of rural post roads	74,000,000	75,000,000	+ 1,000,000
Mt. Vernon Memorial Highway	2,423,000	2,000,000	- 423,000
Total, road funds	84,423,000	84,500,000	+ 77,000
Grand Total, Department of Agriculture	163,389,637	165,898,506	+ 2,508,869



DETAIL BY SUBAPPROPRIATIONS

Bureau and Item	Available 1930	Budget Allowance, 1931	
		Amount	Increase or decrease com- pared with 1930
<u>OFFICE OF THE SECRETARY:</u>			
Salaries.....	\$727,450	\$ 737,000	+ \$9,550
Mechanical shops and power plant.	101,000	102,000	+ 1,000
Miscellaneous expenses.....	148,500	198,000	+ 49,500
Rent of buildings.....	203,440	100,000	- 103,440
Total	1,180,390	1,137,000	- 43,390
<u>OFFICE OF INFORMATION:</u>			
Salaries and expenses.....	400,000	410,000	+ 10,000
Printing and binding.....	842,000	942,000	+ 100,000
Total.....	1,242,000	1,352,000	+ 110,000
<u>LIBRARY:</u>			
Salaries and expenses.....	102,000	105,000	+ 3,000
<u>OFFICE OF EXPERIMENT STATIONS:</u>			
Payments to States and Hawaii experiment stations:			
Hatch Act.....	720,000	720,000	---
Adams Act.....	720,000	720,000	---
Purnell Act.....	2,880,000	2,880,000	---
Hawaii Station Act.....	15,000	20,000	+ 5,000
Salaries and expenses:			
Administration of stations:	155,000	169,000	+ 14,000
Insular experiment stations:			
Alaska.....	85,000	85,000	---
Hawaii.....	45,000	45,000	---
Porto Rico.....	59,000	59,000	---
Guam.....	29,000	30,000	+ 1,000
Virgin Islands.....	29,000	30,000	+ 1,000
Total	4,737,000	4,758,000	+ 21,000

DETAIL BY SUBAPPROPRIATIONS (CONTINUED)

Bureau and Item	Available 1930	Budget Allowance, 1931	
		Amount	Increase or decrease com- pared with 1930
<u>EXTENSION SERVICE:</u>			
Payments to States, Hawaii and Alaska:			
Cooperative agricultural ex- tension (supp. Smith-Lever)	\$1,580,000	\$1,580,000	- - -
Cooperative agricultural ex- tension (Capper-Ketcham).	1,480,000	1,480,000	- - -
Cooperative agricultural ex- tension (Alaska)	- - - -	10,000	+\$10,000
Salaries and expenses:			
General administration	12,000	15,000	+ 3,000
Farmers' Cooperative demon- strations	1,495,000	1,550,000	+ 55,000
Agricultural exhibits at fairs	120,000	120,000	- - -
Cooperative farm forestry . . .	(a) 65,000	70,000	+ 5,000
Flood relief, farm lands	(b) 61,615		- 61,615
Cooperative agricultural ex- tension. (permanent annual) . .	4,602,936	4,602,936	- - -
Total	9,416,551	9,427,936	+ 11,385
<u>WEATHER BUREAU:</u>			
Salaries and expenses:			
General administrative expenses	136,000	136,000	- - -
General Weather Service and Research	(c) 2,474,000	2,530,000	+ 56,000
Horticultural protection . . .	(d) 40,400	40,400	- - -
Aerology	(e) 800,000	1,400,000	+600,000
Total	3,450,400	4,106,400	+656,000

(a) Includes \$5,000 unexpended balance 1928, reappropriated for 1930.

(b) Available from unexpended balance of \$400,000 appropriation for 1929, reappropriated for 1930 by Act approved June 13, 1929 (Public No. 8, 71st Congress.)

(c) Exclusive of \$10,000 transferred to the Coast Guard for custody and maintenance of Seacoast Telegraph Lines.

(d) Includes \$7,000 of the \$7,500 provided for 1929-1930 by the Second Deficiency Act, 1929, for extension of fruit-frost work.

(e) Exclusive of \$50,000 made immediately available in the 1930 appropriation act and expended during 1929.

Bureau and Item	Available 1930	Budget Allowance, 1931	
		Amount	Increase or decrease com- pared with 1930
<u>BUREAU OF ANIMAL INDUSTRY:</u>			
Salaries and expenses:			
General administrative expenses	\$182,900	\$182,900	- - -
Inspection and quarantine . . .	(a) 783,600	795,000	+ \$11,400
Tuberculosis eradication:			
Operating expenses	1,190,000	1,190,000	- - -
Indemnities	(b) 5,171,000	(f) 5,000,000	- 171,000
Eradicating cattle ticks	736,000	770,000	+ 34,000
Animal Husbandry.	520,790	660,000	+ 139,210
Diseases of animals	353,780	410,000	+ 56,220
Hog cholera	497,000	497,000	- - -
Eradicating dourine	(c) 32,800	17,500	- 15,300
Enforcement of the packers and stockyards act	(d) 415,000	(g) 415,000	- - -
Meat inspection (supplemental)...	(e) 2,620,000	2,640,000	+ 20,000
Meat inspection (permanent annual)	3,000,000	3,000,000	- - -
Total	15,502,870	15,577,400	+ 74,530
<u>BUREAU OF DAIRY INDUSTRY:</u>			
Salaries and expenses			
General administrative expenses	67,000	67,000	- - -
Dairy investigations	520,500	570,000	+ 49,500
Field Station, Woodward, Oklahoma	12,300	12,300	- - -
Dairy and livestock experiment station, Tennessee	50,000	20,000	- 30,000
Total	649,800	669,300	+ 19,500

(a) Includes \$15,000 unexpended balance 1928, reappropriated for 1930.

(b) Includes \$300,000 unexpended balance 1928, reappropriated for 1930.

(c) Includes \$4,800 unexpended balance 1928, reappropriated for 1930.

(d) Includes \$30,000 unexpended balance 1928, reappropriated for 1930.

(e) Includes \$20,000 unexpended balance 1928, reappropriated for 1930.

(f) Includes \$650,000 unexpended balance 1929, to be reappropriated for 1931.

(g) Includes \$35,000 unexpended balance 1929, to be reappropriated for 1931.

DETAIL BY SUBAPPROPRIATIONS (CONTINUED)

Bureau and Item	Available 1930	Budget Allowance, 1931	
		Amount	Increase or decrease com- pared with 1930
<u>BUREAU OF ANIMAL INDUSTRY:</u>			
Salaries and expenses:			
General administrative expenses	\$182,900	\$182,900	- - -
Inspection and quarantine	(a) 783,600	795,000	+ \$11,400
Tuberculosis eradication:			
Operating expenses	1,190,000	1,190,000	- - -
Indemnities	(b) 5,171,000	(f) 5,000,000	- 171,000
Eradicating cattle ticks	736,000	770,000	+ 34,000
Animal Husbandry.	520,790	660,000	+ 139,210
Diseases of animals	353,780	410,000	+ 56,220
Hog cholera	497,000	497,000	- - -
Eradicating dourine	(c) 32,800	17,500	- 15,300
Enforcement of the packers and stockyards act	(d) 415,000	(g) 415,000	- - -
Meat inspection (supplemental)...	(e) 2,620,000	2,640,000	+ 20,000
Meat inspection (permanent annual)	3,000,000	3,000,000	- - -
Total	15,502,870	15,577,400	+ 74,530
<u>BUREAU OF DAIRY INDUSTRY:</u>			
Salaries and expenses			
General administrative expenses	67,000	67,000	- - -
Dairy investigations	520,500	570,000	+ 49,500
Field Station, Woodward, Oklahoma	12,300	12,300	- - -
Dairy and livestock experiment station, Tennessee	50,000	20,000	- 30,000
Total	649,800	669,300	+ 19,500

(a) Includes \$15,000 unexpended balance 1928, reappropriated for 1930.

(b) Includes \$300,000 unexpended balance 1928, reappropriated for 1930.

(c) Includes \$4,800 unexpended balance 1928, reappropriated for 1930.

(d) Includes \$30,000 unexpended balance 1928, reappropriated for 1930.

(e) Includes \$20,000 unexpended balance 1928, reappropriated for 1930.

(f) Includes \$650,000 unexpended balance 1929, to be reappropriated for 1931.

(g) Includes \$35,000 unexpended balance 1929, to be reappropriated for 1931.

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DETAIL BY SUBAPPROPRIATIONS (CONTINUED)

Bureau and Item	Available 1930	Budget Allowance, 1931	
		Amount	Increase or decrease com- pared with 1930
<u>BUREAU OF PLANT INDUSTRY:</u>			
Salaries and expenses:			
General administrative expenses	\$207,000	\$207,000	- - -
Mycology and disease survey . .	58,500	59,500	+ \$1,000
Citrus canker eradication . . .	45,000	45,000	- - -
Forest pathology (a)	190,052	210,000	+ 19,948
Blister rust control	454,700	454,700	- - -
Plant nutrition	17,990	17,990	- - -
Cotton production and diseases	140,500	200,000	+ 59,500
Rubber, fiber and other tropi- cal plants	160,000	160,000	- - -
Drug and related plants	37,700	37,700	- - -
Nematology	57,900	57,900	- - -
Seed laboratory	77,800	77,800	- - -
Cereal crops and diseases . . .	431,000	535,000	+ 104,000
Barberry eradication.	379,920	379,920	- - -
Tobacco investigations.	70,310	80,310	+ 10,000
Sugar plants	257,000	262,000	+ 5,000
Botany	53,800	53,800	- - -
Dry land agriculture.	333,900	363,900	+ 30,000
Western irrigation agriculture	145,600	150,600	+ 5,000
Horticultural crops and diseases. (b)	1,154,731	1,257,000	+ 102,269
Phony peach eradication	85,000	85,000	- - -
Gardens and grounds	97,740	97,740	- - -
Arlington farm.	60,000	60,000	- - -
Foreign plant introduction . . . (c)	210,700	222,000	+ 11,300
Forage crops and diseases . . .	205,000	215,000	+ 10,000
Biophysical laboratory.	36,000	36,000	- - -
Total	4,967,843	5,325,860	+ 358,017

(a) Exclusive of \$5,000 expended in 1929 from funds made immediately available in the Act for 1930, for European larch canker.

(b) Includes \$5,000 provided by Second Deficiency Act, 1929, for black walnut investigations in the Middle West, but does not include \$85,000 provided in the 1930 Act for phony peach eradication and which is being set up as a separate subappropriation in 1931.

(c) Includes \$7,500 available from an appropriation of \$10,000 provided by Second Deficiency Act, 1929, fiscal years 1929-1930, for wilt-resistant alfalfa explorations.

DETAIL BY SUBAPPROPRIATIONS (CONTINUED)

Bureau and Item	Available	Budget Allowance, 1931	
	1930	Amount	Increase or decrease compared with 1930
<u>FOREST SERVICE:</u>			
Salaries and expenses:			
General administrative expenses	\$362,230	\$362,230	- - -
National forest administration	6,703,000	6,985,000	+ \$282,000
Fighting forest fires.	100,000	100,000	- - -
Aerial fire control.	50,000	50,000	- - -
Classification of lands.	52,500	52,500	- - -
Sanitation and fire prevention	50,000	57,000	+ 7,000
Equipment and supplies	130,000	130,000	- - -
Planting, national forests . . .	210,000	225,000	+ 15,000
Reconnaissance of forest . . .			
resources.	108,550	121,000	+ 12,450
Improvements, national forests	645,000	2,500,000	+1,855,000
Silvical investigations.	413,000	473,000	+ 60,000
Range investigations	67,000	85,000	+ 18,000
Forest products.	585,000	635,000	+ 50,000
Forest survey.	40,000	125,000	+ 85,000
Forest economics	25,000	50,000	+ 25,000
Forest fire cooperation.	1,400,000	1,700,000	+ 300,000
Cooperative distribution of forest planting stock....	83,000	93,000	+ 10,000
Acquisition of additional forest lands.	2,000,000	2,000,000	- - -
Total, exclusive of forest Service receipts funds.	13,024,280	15,743,730	+2,719,450
Forest Service receipts funds:			
Refunds to depositors.	75,000	75,000	- - -
National Forest Reservation Commission	500	500	- - -
Payments to States and Terri- tories	1,400,000	1,600,000	+ 200,000
Cooperative work, Forest Service.	1,400,000	1,700,000	+ 300,000
Payments to school funds, Arizona and New Mexico	40,000	40,000	- - -
Roads and trails for States. . .	530,000	600,000	+ 70,000
Total, receipts funds . . .	3,445,500	4,015,500	+ 570,000
Total, Forest Service . . .	16,469,780	19,759,230	+3,289,450

DETAIL BY SUBAPPROPRIATIONS (CONTINUED)

Bureau and Item	Available 1930	Budget Allowance, 1931	
		Amount	Increase or decrease com- pared with 1930
<u>BUREAU OF CHEMISTRY AND SOILS:</u>			
Salaries and expenses:			
General administrative expenses	\$58,540	\$58,540	---
Agricultural chemical investi- gations.....	286,570	340,000	+ \$53,430
Color investigations.....	78,000	88,000	+ 10,000
Sirup and sugar investigations..	37,600	37,600	---
Insecticide and fungicide investi- gations.....	83,765	100,000	+ 16,235
Dust explosions and farm fires .	51,500	51,500	---
Naval stores investigations.....	32,000	32,000	---
Soil chemical investigations....	36,100	40,000	+ 3,900
Soil physical investigations....	18,100	18,100	---
Fertilizer investigations.....	336,500	345,000	+ 8,500
Soil survey investigations.....	274,000	310,000	+ 36,000
Soil erosion investigations.....	160,000	160,000	---
Soil microbiology investigations	43,400	43,400	---
Soil fertility investigations...	159,000	200,000	+ 41,000
Total.....	1,655,075	1,824,140	+ 169,065
<u>BUREAU OF ENTOMOLOGY:</u>			
Salaries and expenses:			
General administrative expenses.	91,000	93,000	+ 2,000
Deciduous fruit insects.....	352,790	385,000	+ 32,210
Tropical and subtropical insects (a)	136,500	166,500	+ 30,000
Truck crop insects.....	278,560	315,000	+ 36,440
Forest insects.....	204,000	220,000	+ 16,000
Cereal and forage insects..... (b)	466,008	535,000	+ 68,992
Cotton insects..... (c)	303,120	303,120	---
Insects affecting man and animals (d)	93,900	115,000	+ 21,100
Stored products insects.....	71,900	87,000	+ 15,100
Taxonomy and interrelations....	145,000	171,000	+ 26,000
Bee culture.....	54,400	75,000	+ 20,600
Total.....	2,197,178	2,465,620	+ 268,442

(a) Includes \$6,000 provided by Second Deficiency Act, 1929, fiscal years 1929-1930, the entire amount remaining available for 1930, for Cuban white fly.

(b) Exclusive of \$4,612 expended in 1929 from funds made immediately available in the Act for 1930, for cricket control in Colorado.

(c) Part of unexpended balance of the appropriation of \$5,000,000 for establishing and enforcing noncotton zones, carried in Second Deficiency Act, 1928, and reappropriated for 1930.

(d) Includes \$10,000 available from an appropriation of \$12,000 provided by Second Deficiency Act, 1929, fiscal years 1929-1930, for investigations of "eye" gnats.

DETAIL BY SUBAPPROPRIATIONS (CONTINUED)

Bureau and Item	Available 1930	Budget Allowance, 1931	
		Amount	Increase or decrease com- pared with 1930
BUREAU OF BIOLOGICAL SURVEY:			
Salaries and expenses:			
General administrative expenses..	\$73,280	\$77,520	+ \$4,240
Maintenance of mammal and bird reservations.....	75,000	80,000	+ 5,000
Food habits of birds and other animals (including rodent and predatory animal des- truction).....	633,273	680,000	+ 46,727
Production and conservation of fur-bearing animals	51,200	64,000	+ 12,800
Biological investigations	56,800	78,000	+ 21,200
Protection of migratory birds....	173,013	192,000	+ 18,987
Reindeer, game and fur-bearers in Alaska.....	101,000	112,000	+ 11,000
Upper Mississippi River Refuge:			
Administrative expenses	40,600	47,000	+ 6,400
Land purchases	150,000	150,000	- - -
Bear River Migratory Bird Refuge:			
Establishment and acquisition of land	(a) 236,816	75,000	- 161,816
Administration and maintenance...	- - - -	19,000	+ 19,000
Migratory Bird Conservation Act:			
Migratory bird conservation refuges	75,000	200,000	+ 125,000
Migratory bird conservation commission.....	5,000	5,000	- - -
Total.....	1,670,982	1,779,520	+ 108,538
BUREAU OF PUBLIC ROADS:			
Salaries and expenses:			
General administrative expenses..	70,500	70,500	- - -
Road management	65,000	65,000	- - -
Road building and maintenance ...	72,900	72,900	- - -
Agricultural engineering.....	287,000	392,000	+ 105,000
Total.....	495,400	600,400	+ 105,000

(a) Includes \$161,816 unexpended balance of the appropriation for this purpose contained in Second Deficiency Act, 1928, reappropriated for 1930.

Bureau and Item	Available 1930	Budget Allowance, 1931	
		Amount	Increase or decrease com- pared with 1930
BUREAU OF AGRICULTURAL ECONOMICS:			
Salaries and expenses:			
General administrative expenses..	\$286,000	\$286,000	- - -
Farm management and practice.....	409,000	437,000	+ 28,000
Marketing and distributing farm products.....	774,900	836,800	+ 61,900
Crop and livestock estimates.....	732,000	797,000	+ 65,000
Foreign competition and demand...	113,000	153,000	+ 40,000
Market inspection of farm products.....	440,000	475,000	+ 35,000
Market news service.....	1,304,260	1,375,000	+ 70,740
Cooperative marketing..... (a)	- - -	- - -	- - -
Estimates of cotton grade and staple.....	420,000	420,000	- - -
Tobacco stocks and standards..... (b)	25,000	25,000	- - -
Enforcement of cotton futures and cotton standards acts.....	219,500	234,500	+ 15,000
Enforcement of grain standards act.	820,000	840,000	+ 20,000
Administration of warehouse act....	256,000	256,000	- - -
Enforcement of standard container, hamper, and produce agency acts..	40,000	45,000	+ 5,000
Completion of wool work (War In- dustries Board).....	8,000	8,000	- - -
Wool marketing studies	50,000	50,000	- - -
Operation of Center Market.....	150,000	- - -	- 150,000
Total	6,047,660	6,238,300	+ 190,640
BUREAU OF HOME ECONOMICS:			
Salaries and expenses:			
General administrative expenses	18,500	18,500	- - -
Home Economics investigations...	149,000	189,200	+ 40,200
Total.....	167,500	207,700	+ 40,200

(a) Appropriation for "Cooperative Marketing", 1930, was \$290,000. Effective October 1, 1929 this work and unobligated balance of appropriation was transferred by Executive Order to the Federal Farm Board. Up to the date of transfer approximately \$63,000 of the 1930 appropriation had been obligated by the Department of Agriculture.

(b) Available from an appropriation of \$30,000 provided by the Second Deficiency Act, 1929, fiscal years 1929-1930, for tobacco statistics.

DETAIL BY SUBAPPROPRIATIONS (CONTINUED)

Bureau and Item	Available 1930	Budget Allowance, 1931	
		Amount	Increase or decrease con- pared with 1930
<u>PLANT QUARANTINE AND CONTROL ADMIN.:</u>			
Salaries and expenses:			
General administrative expenses..	\$73,000	\$73,000	- - -
Enforcement of foreign plant quarantines.....	550,000	700,000	+ 150,000
Transit inspection service.....	- - -	40,000	+ 40,000
Preventing spread of pink bollworm of cotton.....	(a) 552,120	497,000	- 55,120
Preventing spread of date scale.....	(b) 78,700	65,000	- 13,700
Preventing spread of <i>Thurberia</i> weevil.....	34,300	34,300	- - -
Preventing spread of moths.....	567,500	647,500	+ 80,000
Preventing spread of European corn borer.....	(c) 948,000	1,000,000	+ 52,000
Preventing spread of Japanese and Asiatic beetles.....	267,000	475,000	+ 208,000
Preventing spread of white- pine blister rust.....	27,000	10,000	- 17,000
Preventing spread of phony peach disease.....	(d) 14,045	12,000	- 2,045
Preventing spread of Mexican fruit worm.....	(e) 115,000	115,000	- - -
Certification of exports.....	30,000	30,000	- - -
Total.....	3,256,665	3,698,800	+ 442,135
<u>GRAIN FUTURES ADMINISTRATION:</u>			
Enforcement of the grain futures act.....	(f) 140,000	155,000	+ 15,000

(a) Consists of \$155,000 unexpended balance of funds available for 1929 and continued available for 1930, together with \$397,120 of unexpended balance of appropriation of \$5,000,000 for establishing and enforcing noncotton zones, carried in Second Deficiency Act, 1928.

(b) Exclusive of \$8,000 expended in 1929 from funds made immediately available in the Act for 1930.

(c) Includes \$50,000 unexpended balance of \$10,000,000 appropriated by joint resolution of February 23, 1927, making an appropriation for the eradication or control of the European corn borer, reappropriated for 1930.

(d) Exclusive of \$955 expended in 1929 from funds made immediately available in the Act for 1930.

(e) Includes \$30,000 unexpended balance of appropriation for this purpose contained in First Deficiency Act, 1928, reappropriated for 1930.

(f) Includes \$30,000 unexpended balance 1928, reappropriated for 1930.

DETAIL BY SUBAPPROPRIATIONS (CONTINUED)

Bureau and Item	Available	Budget Allowance, 193	
	1930	Amount	Increase or decrease compared with 1930
FOOD AND DRUG ADMINISTRATION:			
Salaries and expenses:			
General administrative expenses	\$104,000	\$ 104,000	-
Collaboration with other departments	16,300	-	-\$ 16,300
Enforcement of the food and drugs act	1,030,000	1,105,000	+ 75,000
Enforcement of the tea importation act	43,800	43,800	-
Enforcement of the naval stores act	39,500	39,500	-
Enforcement of the insecticide act	224,000	224,000	-
Enforcement of the milk importation act	53,000	53,000	-
Enforcement of the caustic poison act	26,700	26,700	-
Total	1,537,300	1,596,000	+ 58,700
MISCELLANEOUS ITEMS:			
Livestock production, South	43,500	48,500	+ 5,000
Dairying and livestock prod., West	60,500	65,500	+ 5,000
Collection of seed-grain loans . . .	10,000	90,000	+ 80,000
Special corn borer research:			
Bureau of Animal Industry (a)	10,000	(c) -	- 10,000 (c)
Bureau of Plant Industry (a)	55,000	(b) 55,000	-
Bureau of Chemistry and Soils . . . (a)	30,000	(b) 30,000	-
Bureau of Entomology (a)	40,000	(c) -	- 40,000 (c)
Bureau of Public Roads (a)	75,000	(c) -	- 75,000 (c)
Bureau of Agricultural Economics . . (a)	40,000	(b) 40,000	-
Total, special corn borer research	250,000	125,000	-125,000 (c)

- (a) Part of unexpended balance of \$10,000,000 appropriated by joint resolution of February 23, 1927, making an appropriation for eradication or control of European corn borer, reappropriated for 1930.
- (b) Part of unexpended balance of \$10,000,000 appropriated by joint resolution of February 23, 1927, making an appropriation for eradication or control of European corn borer, to be reappropriated for 1931.
- (c) Continuation of this work provided for 1931 by direct appropriations recommended under the Bureaus concerned.

DETAIL BY SUBAPPROPRIATIONS (CONTINUED)

Bureau and Item	Available 1930	Budget Allowance, 1931	
		Amount	Increase or decrease com- pared with 1930
MISCELLANEOUS ITEMS(CONTINUED):			
Special leaf hopper research . . .	(a) \$215,900	\$215,900	-
South Carolina experiment station	40,000	40,000	-
Special barley investigations	(b) 25,343	(h) -	- \$ 25,343
Fourth World's Poultry Congress ..	(c) 25,000	-	- 25,000
Operation of national arboretum ..	-	30,000	+ 30,000
Total, foregoing miscellaneous items	670,243	614,900	- 55,343
TOTAL, GENERAL ACTIVITIES (ALL FOREGOING ITEMS)	75,556,637	81,398,506	+ 5,841,869
SPECIAL ITEMS:			
Loans to farmers in southeastern States	(d) 375,000	-	- 375,000
Preventing spread of Mediterranean fruit fly	(e) 3,035,000	-	- 3,035,000
Total, special items	3,410,000	-	- 3,410,000
ROAD FUNDS:			
Forest roads and trails	8,000,000	7,500,000	- 500,000
Federal-aid highway system . . .	74,000,000	75,000,000	+ 1,000,000
Mt. Vernon Memorial Highway . . .	(f) 2,423,000	2,000,000	- 423,000
Total, road funds	(g) 84,423,000	84,500,000	+ 77,000
TOTAL, ALL PURPOSES	163,389,637	165,898,506	+ 2,508,869

- (a) Exclusive of \$14,100 expended in 1929 from funds made immediately available by the Act for the fiscal year 1930.
- (b) Available from an appropriation of \$38,280 provided by Second Deficiency Act, 1929, fiscal years 1929-1930.
- (c) Provided by Second Deficiency Act, 1929, fiscal years 1929-1930, the entire amount remaining available for 1930.
- (d) Available from the appropriation of \$6,000,000 provided for 1929-1930 by the Second Deficiency Act, 1929, \$225,000 for the collection of loans in southeastern States during 1930, and \$150,000 for loans to be made to vegetable growers in southern Florida during the fall of the calendar year 1929.
- (e) Available from the \$4,250,000 provided by Public Resolution #1, 71st Congress.
- (f) Unexpended balance of appropriation of \$2,500,000 contained in Second Deficiency Act, 1928, the availability of which is extended to June 30, 1930.
- (g) Exclusive of \$3,280,169, unexpended balance of appropriation of \$5,197,294 contained in 1929 Appropriation Act, and available for use in 1930; and \$3,654,000 made available by the Act making appropriations for the War Department for the fiscal year 1930, for flood relief, roads and bridges.
- (h) Merged with regular appropriations for 1931 for Bureaus of Animal Industry and Plant Industry.

(SEE RECONCILIATION ON FOLLOWING PAGES)

Handwritten text, likely a letter or document, written in cursive script. The text is dense and covers most of the page, with some lines appearing to be crossed out or corrected. The handwriting is somewhat faded and the ink is dark. The document appears to be a personal or official communication, possibly a letter or a report, given the formal yet personal nature of the script. The text is written in a cursive style common in the 18th or 19th centuries. There are several lines of text, some of which are indented, suggesting a structured format or a list of points. The overall appearance is that of an old, handwritten manuscript.

RECONCILIATION BETWEEN TOTAL OF 1930 APPROPRIATIONS
AS SHOWN BY 1931 BUDGET (\$155,729,990) AND TOTAL OF AVAILABLE
FUNDS FOR 1930 AS SHOWN IN THIS STATEMENT (\$163,332,637)

Total 1930 Appropriations as shown by the Bureau of
the Budget \$155,729,990

Plus:

Reappropriations:-

Definite unexpended balance from prior years, reappropriated for use in 1930	\$1,435,040
Unexpended balance, appropriation for Bear River Migratory Bird Refuge, re- appropriated for 1930	161,816
Unexpended balance, appropriation for pink bollworm, continued available for 1930	155,000
Unexpended balance, appropriation for Mt. Vernon Memorial Highway, continued available for 1930	2,423,000
Unexpended balance, 1929 appropriation of \$400,000 for flood relief, devas- tated farm lands, continued available for 1930	61,615
Funds available from \$4,250,000 provided by Public Resolution No. 1, 71st Congress, for Mediterranean fruit fly	3,035,000
Funds available from appropriation of \$6,000,000 for loans to farmers, southeastern States	375,000

Unapportioned and unobligated balances of
1929-1930 appropriations provided by
Second Deficiency Act, 1929, and available
for 1930:

Extension of fruit-frost work (Weather Bureau)	7,000	
Wilt-resistant alfalfa explorations (Bureau of Plant Industry)	7,500	
Cuban white fly (Bureau of Entomology).	6,000	
Investigations of "eye" gnats (Bureau of Entomology)	10,000	
Tobacco stocks and standards (Bureau of Agricultural Economics	25,000	
Special barley investigations (Bureaus of Animal Industry and Plant Industry)	25,343	
Fourth World's Poultry Congress (Extension Service)	<u>25,000</u>	<u>7,752,314</u>
		163,482,304

RECONCILIATION OF 1930 APPROPRIATIONS (Continued)Minus:

Transfer from "Out of Washington" expenses
 (Weather Bureau) to Coast Guard for
 custody and maintenance of Seacoast
 Telegraph Lines \$10,000

Funds made "immediately available" in
 1930 Act and expended in 1929:

Aerology (Weather Bureau)	50,000	
Forest Pathology, Bureau of Plant Industry (European larch canker)	5,000	
Cereal and forage insects, Bureau of Entomology (Cricket control)	4,612	
Preventing spread of date scale (Plant Quarantine and Control Administration)	8,000	
Preventing spread of phony peach disease (Plant Quarantine and Control Admin- istration)	955	
Special leaf hopper research	14,100	\$92,667

Total, 1930 available funds as shown
 in this statement

163,389,637

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EXPLANATORY NOTES

of the following bureaus

(Pages 20 to 273, inc.)

Office of the Secretary	Weather Bureau
Office of Information	Bureau of Animal Industry
Library	Bureau of Dairy Industry
Experiment Stations	Bureau of Plant Industry
Extension Service	Forest Service

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OFFICE OF THE SECRETARY(a) SALARIES

Appropriation, 1930	\$ 727,450
Budget, 1931	737,000
Increase	9,550

The increase of \$9,550 is submitted for the following purposes:

(1) \$1,000 to provide for increase in the salary of the position of Assistant Secretary of Agriculture from \$9,000 to \$10,000, to make the compensation more nearly in accord with the duties and responsibilities of this position and on the same basis as comparable positions in other departments, some of which already are paid at the rate of \$10,000 and others of which are being submitted in the same manner.

(2) \$3,060 for two additional employees, one at \$1,620 and one at \$1,440. The position at \$1,620 is for assignment to the Office of Accounts, Office of the Secretary, where the volume of work necessitates considerable overtime. The Office of Accounts handles the growing accounting work not only for the Office of the Secretary proper, but for the Extension Service, the Office of Experiment Stations, the Office of Information, the Bureau of Home Economics, and the Grain Futures Administration. The force should be increased by at least one employee in order to keep the work current.

One additional stenographer at \$1,440 is needed to replace stenographers on annual or sick leave and to fill in in emergencies requiring additional help. The Office of the Secretary is from time to time seriously inconvenienced by inability to furnish on short notice stenographic help to cope with the work of the general operating branches which increases annually with the growth of the Department generally.

(3) \$5,490 for promotions of employees. The promotion of efficient employees on the Secretary's roll has been seriously hampered by lack of funds. Promotions effective July 1, 1929, on this roll could be made only to the extent of 0.6 per cent of the total salary roll involved. Slowness and inadequacy of promotion in the Secretary's branch operate against the efficiency of the units concerned and against the interest of the employees involved and a real need exists for additional funds for promotion. Only a part of the increase recommended will be available for promotions by administrative action; some portion will be needed for reallocations under the Classification Act.

Project Statement.

	<u>Expended,</u> <u>1929</u>	<u>Estimated,</u> <u>1930</u>	<u>Estimated,</u> <u>1931</u>	<u>Increase</u>
Secretary of Agriculture ..	\$ 15,000	\$ 15,000	\$ 15,000	----
Assistant Secretary and other personal services ..	701,678	705,156	714,706	\$9,550 (1-2-3)
Extra labor and emergency employments	7,292	7,294	7,294	----
Total	723,970	727,450	737,000	9,550

OFFICE OF THE SECRETARY (Continued)Activities under this Appropriation

This appropriation provides salaries for employees of the offices of the Secretary, Assistant Secretary, the Director of Scientific Work, the Director of Regulatory Work (office force paid by Food and Drugs), the Director of Extension Work (office force paid by Extension Service), the Director of Personnel and Business Administration, the personnel and salary classification offices, the budget, finance, disbursing, and accounting offices, the offices dealing with purchases, sales, and traffic, the Office of the Chief Clerk, mails and files, building maintenance and guard force, telephones and telegraph, post office, etc., and the Office of the Solicitor.

(b) COMPENSATION, MECHANICAL SHOPS AND POWER PLANT

Appropriation, 1930	\$ 101,000
Budget, 1931	<u>102,000</u>
Increase	1,000

The increase of \$1,000 is needed to provide a limited number of promotions in the force of the Mechanical Shops, especially for increasing the compensation of some of the lower-salaried employees, many of whom are receiving less than \$1,200 per annum.

Project Statement

	<u>Expended,</u> <u>1929</u>	<u>Estimated,</u> <u>1930</u>	<u>Estimated,</u> <u>1931</u>	<u>Increase</u>
Compensation, Mechanical				
Shops and Power Plant ...	\$ 113,042	\$ 101,000	\$ 102,000	\$1,000

Activities under this Appropriation

This appropriation provides the compensation of the personnel in the Mechanical Shops and Power Plant of the department. This force performs work in the repair of buildings, the construction of apparatus and models for the various bureaus of the department, and the maintenance and operation of the power plant which furnishes heat and distributes electricity to nineteen buildings. Under the law the work performed by the Mechanical Shops for the several bureaus of the department is reimbursed to the appropriation at cost, but expenditures for general operations in the maintenance of the department, such as the power plant, elevator service, repairs to plumbing, heating, and electric systems, and the like, which require practically the entire base appropriation, are not reimbursable.

OFFICE OF THE SECRETARY (Continued)(c) MISCELLANEOUS EXPENSES

Appropriation, 1930	\$ 148,500
Budget, 1931	<u>198,000</u>
Increase	49,500

The increase of \$49,500 is submitted for the following purposes:

(1) \$40,000 for new roofs, East and West Wings, Department of Agriculture buildings. For many years these roofs have caused annoyance and damage by leaking. The trouble appears to be due to the method of construction with tiles ridged at intervals, which have expanded with the heat of summer and have been forced upward at many points. When contraction from cold occurs they do not fall back into position and the resulting cracks let in water which finds its way down the roof under the tiling and makes its way through ceilings into the rooms of the top story. Department mechanical forces have attempted many times to check these leaks, but have not been able to do so, nor have commercial roofers. The advice of the Supervising Architect has been sought and he has stated that it is his belief that the roofs will have to be replaced and estimates that this, together with necessary repairs to tile flooring around the roofs, downspouts, etc., will cost \$40,000.

(2) \$4,600 for replacement of motor vehicles. The automobile purchased under authority of law for the official use of the Secretary of Agriculture is four years old and should be replaced. Not to exceed \$4,000 is estimated for this replacement. The car now in use will be turned in in part payment. \$600 is estimated for replacement of a small car for official use which is now five years old and cannot be economically repaired or kept in running condition.

(3) \$4,900 for heat, light, and power involved in operation of the new Administration Building. The new Administration Building, which will be occupied in the late winter or early spring of 1930, will require heat for office rooms comprising about 65,000 square feet, besides corridors, basement, toilet rooms, and the central court. Electric current will be required for the proper lighting of the building, the operation of three elevators, and for electrically driven fans, adding machines, etc.

Project Statement

	<u>Expended,</u> <u>1929</u>	<u>Estimated,</u> <u>1930</u>	<u>Estimated,</u> <u>1931</u>	<u>Increase</u>
Miscellaneous Expenses	\$ 142,271	\$ 148,500	\$ 198,000	\$ 49,500

Activities under this Appropriation.

This appropriation, as shown by its terms, provides for a great variety of miscellaneous objects necessary in the conduct of the work of the department, the largest item being approximately \$48,000 a year for coal. It provides also for stationery, furniture and office equipment, lumber, hardware, paint, telegraphing, telephones, ice, postage, repairs and improvements to buildings and heating apparatus, freight and express charges, and miscellaneous supplies and expenses not otherwise provided for and necessary for the practical and efficient work of the department.

OFFICE OF THE SECRETARY (Continued)Change in language.

The language of this item has been amended by the insertion, after the word "four," of the words "and purchase and exchange of two," to provide for the replacement of two automobiles as indicated in Note 2, above.

(d) RETURN TO SECRETARY OF AGRICULTURE
OF JURISDICTION OF PROPERTY AT MT. WEATHER, VA.

This item restores the property at Mt. Weather, Va., to the jurisdiction of the Department of Agriculture. The Director of Public Buildings and Parks has not assumed jurisdiction of the property for the purposes set forth in the Second Deficiency Act, 1929 (Public 1035, 70th Congress, approved March 4, 1929) and has requested that action be taken to place the reservation in the same status it occupied prior to the passage of the last Deficiency Act.

(c) RENT OF BUILDINGS

Appropriation, 1930	\$ 203,440
Budget, 1931	<u>100,000</u>
Decrease	103,440

Condemnation proceedings for Squares 263 and 264, bounded by 13th, B, 14th, and C Streets, S.W., are about concluded and it is expected that all properties in these squares will soon pass to the ownership of the United States. The squares are being acquired as the site for the so-called Extensible Building for the department. Within the two squares the department now leases ten buildings with an aggregate yearly rental of \$113,530. If the land is acquired as planned, for the fiscal year 1931 and thereafter no rent will be required for these buildings. While the buildings to be taken over now rent for \$113,530, it is proposed to reduce the appropriation by \$103,440 in order to provide for rental of space which will be required to take care of some of the offices now occupying rented space in Square 264, which square will soon be razed as the site for the first unit of the Extensible Building, and for other contingencies. The buildings on which rental will cease when the Government acquires title to the land are:

<u>Buildings to be Acquired by U.S. - Squares 263 and 264.</u>	<u>Annual Rental</u>
1358 B St. (Agricultural Economics; Biological Survey; Library)...	\$ 55,000
220 14th St. (Extension Service; Plant Industry)	24,000
1363 C St. (Motion Picture Laboratory)	9,000
221 Linworth Pl. (Agricultural Econ.; Plant Industry; Central Stores)	5,400
220 Linworth Pl. (Duplicating Section, Photographic Section).....	4,300
215 13th St. (Office of Information)	4,000
1316 B St. (Packers & Stockyards Admin.; Grain Futures Admin.) ...	3,000
1304-1306 B St. (Cercal Investigations, Plant Industry).....	3,000
1350 B Street (Animal Industry)	1,580
200-202 14th St. (Crop Estimates, Agricultural Economics)	<u>3,750</u>
Total	113,530

	<u>Project Statement</u>			<u>Decrease</u>
	<u>Expended,</u> <u>1929</u>	<u>Estimated,</u> <u>1930</u>	<u>Estimated,</u> <u>1931</u>	
Rent of Buildings	\$ 197,431	\$ 203,440	\$ 100,000	\$ 103,440
<u>Activities under this Appropriation</u>				

On November 1, 1929, the department had under lease 22 buildings or parts of buildings in various parts of the District of Columbia. The individual rentals range from as high as \$55,000 a year for the Bieber Building, 1358 B Street, S.W., down to \$360 a year for a small alley structure used for storage. The buildings under lease as of November 1, 1929, are as follows:

<u>Building</u>	<u>Bureau Occupying Space</u>	<u>Annual Rental</u>
1358 B Street, S.W.	Agricultural Economics; Biological Survey; Department Library	\$ 55,000
928-930 F Street, N.W.	Forest Service	35,000
220 14th Street, S.W.	Plant Industry; Extension Service	24,000
Ohio Building	Fixed Nitrogen Research Laboratory	16,000
216 13th Street, S.W.	Chemistry and Soils; Food, Drug, and Insecticide Administration	16,000
513-515 14th St., N.W.	Public Roads	14,000
1363 C Street, S.W.	Motion Picture Laboratory	9,000
221 Linworth Pl., S.W.	Agricultural Economics; Plant Industry; Central Stores	5,400
220 Linworth Pl., S.W.	Duplicating Section; Photographic Section	4,800
215 13th Street, S.W.	Office of Information	4,000
220 13th Street, S.W.	Food, Drug, and Insecticide Administration	4,000
200-202 14th St., S.W.	Agricultural Economics	3,750
1316 B Street, S.W.	Packers and Stockyards Administration; Grain Futures Administration	3,000
1304-1306 B St., S.W.	Plant Industry	3,000
1350 B Street, S.W.	Animal Industry	1,580
215 12th St., S.W. (rear)	Chemistry and Soils; Biological Survey; Food, Drug, and Insecticide Admin.	1,080
2513 M Street, N.W.	Weather Bureau	1,000
1004 Eye St., N.W.	Forest Service (film storage)	1,000
212-214 13th St., S.W.	Food, Drug, and Insecticide Administration	960
210 11th Street, S.W.	Entomology	900
920 F St., N.W. (basement)	Forest Service	600
217 12th St., S.W. (rear)	Chemistry and Soils; Food, Drug, and Insecticide Administration	360
Total		<u>204,430</u>

While the encumbrances for rent in the above statement apparently exceed the appropriation by approximately \$1,000, no deficiency will be incurred. The department was required by the District Fire Department to remove films from the Forest Service building on F Street, N.W., on account of the fire risk. Appropriate storage was rented at \$1,000 per annum, which will be paid from the unused balance of the appropriation for Rent, 1930, arising from the discontinuance of rentals on buildings in Squares 263 and 264, referred to above.

OFFICE OF INFORMATION(a) SALARIES AND GENERAL EXPENSES

Appropriation, 1930	\$400,000
Budget, 1931	<u>410,000</u>
Increase	\$10,000

Reasons for Increase

Although the Office of Information is doing a great deal of educational work in agriculture (as shown under the sub-head "Activities Under Appropriation") the scientific and practical knowledge of agriculture developed by the Department is in advance of actual farm practices. Surveys definitely indicate that farm journals, newspapers, and other periodicals are among the most effective media for introducing improved practices to farmers. The increase of \$10,000 is needed for the employment of two special agricultural writers, who will prepare for press associations, national magazines, farm journals, and the press generally, timely educational and interpretative articles on agriculture, particularly on economic trends in the industry.

Project Statement

	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>	<u>Increase</u>
General	\$37,297	\$38,600	\$38,600	- - -
Publications				
Management	12,838	14,300	14,300	- - -
Editorial Section	15,087	17,700	17,700	- - -
Indexing Section	8,972	10,560	10,560	- - -
Illustrations Section	21,829	24,260	24,260	- - -
Photographic Section	34,411	31,180	31,180	- - -
Printing Section	10,460	11,080	11,080	- - -
Mailing Lists Section	12,481	12,540	12,540	- - -
Congressional Distribution Section	26,415	27,920	27,920	- - -
Miscellaneous Distribution Section	39,160	37,200	37,200	- - -
Addressing, Duplicating & Mailing Sec.	116,238	108,580	108,580	- - -
Press Service	41,092	41,640	51,640	\$10,000
Radio Service	<u>18,613</u>	<u>24,440</u>	<u>24,440</u>	- - -
Total	394,893	400,000	410,000	10,000

Activities Under Appropriation

The fundamental purpose of the Office of Information is to disseminate agricultural educational data, made available by the research program of the Department. This appropriation provides for the salaries of employees

OFFICE OF INFORMATION (Continued)

and for general expenses of operating the three general divisions of the Office of Information - Publications, Press Service and Radio Service.

The Office of Information determines all major problems affecting the informational activities of the Department, including the editorial, printing, illustrating, publication, and distribution phases, and supervises the informational activities of the nineteen bureaus and offices of the Department in matters of publication precedent or policy. Cooperation with 48 colleges and 53 experiment stations is carried on to determine, put into effect, and maintain an effective national policy for agricultural information. The Office also cooperates with the Joint Conference on Printing, the Congressional Joint Committee on Printing, and the Public Printer in establishing the most effective and efficient methods of publication work.

The more important work handled may be summarized as follows:

Press Service

(1) The Press Service issues annually 1,200 releases direct to newspapers, press associations, and correspondents; these disseminate useful information about the Department's work. About 3,500 newspapers are reached weekly through various syndicates; these are mainly informative features with illustrations. The Press Service aids Department workers in placing approximately 1,400 articles annually in outside publications; these are interpretative articles on every phase of agriculture. This division also gives data to special writers. The Yearbook and the Annual Report are prepared.

Radio Service

(2) One hundred and ninety-nine broadcasting stations cooperate with the Radio Service. The Department does not pay for radio time, although commercially it is worth about $1\frac{1}{4}$ million dollars annually. The Department broadcasts five days each week over a network of 39 stations; the addresses are prepared by bureau chiefs, scientists, and others, and are edited by the writers of this section. The Radio Service also prepares manuscript programs for 160 stations, located in 44 States, the District of Columbia and Hawaii. These programs comprise three five-days-a-week features, two bi-weekly features, three weekly features, and one monthly program. In addition to these 1,000 programs annually, many of which are regionalized, special broadcasts are from time to time arranged. Counting regionalized programs as separate manuscripts, 3,000 programs are prepared annually.

Publications

(3) The Division of Publications edits and prepares annually for the Public Printer approximately 1,700 Department manuscripts. The manuscripts handled during 1929 were: Annual Reports, 15; Circulars, 53; Climatological Data, 9; Department Bulletins, 5; Department Circulars, 16; Experiment Sta-

OFFICE OF INFORMATION (Continued)

tion Bulletins and Reports, 12; Farmers' Bulletins (new), 46; Lists of Farmers' Bulletins, 9; Forest Service Map Folders, 21; Indexes, 15; Inventories of Plants Imported, 7; Journal of Agricultural Research Separates, 115; Leaflets, 22; Lists of New Publications, 12; Miscellaneous Circulars, 3; Miscellaneous Publications, 32; North American Fauna, 1; Periodicals, 274; Posters, 5; Regulatory Announcements, 90; Reprints and Revisions of all series, including Farmers' Bulletins, 768; Soil Surveys, 38; Soil Survey Field Operations, 1; Statistical Bulletins, 3; Technical Bulletins, 72; Unnumbered Publications and Reports, 51; Yearbook of Agriculture, 1; total, 1,696. The division distributes through Congressional channels and direct to farmers, scientists, libraries, and others an annual average of 30,000,000 publications. Considerable mimeographed and multigraphed work is produced and distributed. Necessary photographs and illustrations are prepared and specialized mailing lists, made up of 650,000 stencils, are maintained.

(b) PRINTING AND BINDING

Appropriation, 1930	\$842,000
Budget, 1931	942,000
Increase	\$100,000

Reasons for Increase

This is one of the most necessary items presented for the Department of Agriculture. Research is conducted for the purpose of benefiting agricultural and other groups. This purpose is nullified if we do not let the public have the results of our work promptly. This is what is happening now, in a large measure, because funds are not adequate to disseminate valuable information now available in the Department.

The increase of \$100,000 is urgently required to make the fund sufficient to carry on the regular printing and binding work of the Department of Agriculture, and to permit a gradual reduction of the \$833,055 worth of accumulated unpublished manuscripts in the possession of the nineteen bureaus and offices of the Department, which could not be sent to the Public Printer during the fiscal year 1929 because of inadequate funds. This accumulation will increase rather than decrease during the current fiscal year.

The average annual expenditures for printing and binding for the period 1921-1930 were \$744,867.58. In 1923 the expenditures were \$788,365.91 and in 1924 were \$756,546.64. The appropriation was reduced to \$738,000 in 1925 and since then there has been a gradual accumulation of valuable material which should be published. During recent years, up to the 1930 fiscal year, the printing and binding appropriation has been less than the ten-year average and at the same time printing costs have increased materially. Further, research, regulatory, and extension activities of the Department have greatly

OFFICE OF INFORMATION (Continued)

increased, thus increasing the demands for job work and for published material. Since 1924, when the publication program was up-to-date, funds for research have increased by approximately \$5,000,000 and for Departmental work in general, not including road funds, by about \$20,000,000.

The scope and volume of the printing and binding work should be based on the enlarged activities of the nineteen bureaus and offices of the Department. Increased work by any bureau inevitably increases the printing requirements. (Example: The cost of job printing - forms, crop schedules, letterheads - has increased from \$104,637 in 1923 to \$197,815 in 1930.)

The existing congestion of manuscripts prevents the prompt release to the public of much valuable information for which large expenditures have been made in research and other projects. The department has reduced to a minimum the unit costs of printing by using cheap grades of paper, small type, and economical printing units in publications; consequently, no further relief can be found in that direction. This situation is discouraging to the scientists themselves. Scientists are in many cases kept busy replying to letters when it would be infinitely cheaper to give the information by bulletins.

OFFICE OF INFORMATION (Continued)Project Statement

<u>Publication</u>	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>	<u>Increase</u>
Agricultural Situation	\$2,696	\$3,500	\$3,500	- - -
Annual Reports	10,042	10,340	10,340	- - -
Binding	20,559	21,000	23,000	\$2,000
Circulars	16,895	20,000	30,990	10,990
Clip Sheet	3,405	4,000	4,000	- - -
Climatological Data	1,498	2,000	2,000	- - -
Congressional Documents	1,537	1,500	1,500	- - -
Crops and Markets.	56,748	60,000	62,000	2,000
Emergency Field Printing	2,510	4,000	4,000	- - -
Experiment Station Record	17,711	17,700	17,700	- - -
Exper. Sta. Bulletins & Reports	2,773	2,500	3,500	1,000
Farmers' Bulletins- New	26,626	30,000	38,000	8,000
Farmers' Bulletins - Reprints	138,090	136,000	151,000	15,000
Farmers' Bulletin Lists	7,385	13,800	13,800	- - -
Forest Service Recreational Folders	7,729	16,275	16,275	- - -
Forest Worker	1,719	1,700	1,700	- - -
Indexes	-----	-----	5,000	5,000
Inventories, Seeds & Plants Imported	3,392	4,000	4,000	- - -
Job Work	171,340	189,315	197,145	7,830
Journal of Agricultural Research	5,488	5,800	6,200	400
Journal of Agr. Research Separates	18,660	18,000	18,000	- - -
Leaflets	6,486	7,500	10,500	3,000
Leaflet Reprints	-----	-----	2,000	2,000
Letterheads.	7,950	8,500	8,950	450
Lists of New Publications	454	800	800	- - -
Miscellaneous Publications	21,828	25,000	26,750	1,750
Official Record	10,841	11,000	11,000	- - -
Posters	1,443	3,610	6,285	2,675
Service & Regulatory Announcements	9,936	9,000	10,755	1,755
Soil Surveys	47,194	75,000	100,000	25,000
Statistical Bulletins	7,690	10,000	10,000	- - -
Technical Bulletins	49,160	60,000	71,150	11,150
Unnumbered Pubs. and Reports	22,200	28,110	28,110	- - -
Weather Review	8,990	9,500	9,500	- - -
Weather Review - Reprints	654	600	600	- - -
Yearbook	28,733	30,000	30,000	- - -
Yearbook Separates	1,638	1,950	1,950	- - -
Total	742,000	842,000	942,000	100,000

OFFICE OF INFORMATION (Continued)Activities Under Appropriation

The project statement shows printing and binding expenditures. Due to a wide distribution of publications, the stock of publications on hand was approximately one million less on June 30, 1929, than on the same date in 1928.

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LIBRARY, DEPARTMENT OF AGRICULTURE
"SALARIES AND EXPENSES"

Appropriation, 1930.....	\$102,000
Budget, 1931.....	105,000
Increase.....	<u>3,000</u>

The increase of \$3,000 is submitted for the following purposes:

(1) \$2,000 for a bibliographical assistant needed on account of the requests made upon the Library for bibliographical assistance which have greatly increased as the research program of the Department has expanded. The purpose of bibliographical research in connection with any subject is to obtain knowledge of the field, and to keep from duplicating what has already been done. "Many times an experiment costing \$2,000 can be found on library shelves." A special bibliographical assistant is needed in the Library to prepare lists requested on various subjects, and to assist research and other workers in the Department in looking up the literature of the subjects which they are investigating.

The Library is also being called upon more and more by the scientific workers connected with state agricultural colleges and experiment stations and other scientific institutions throughout the country. To meet more efficiently these increasing demands upon the Library for bibliographical assistance, both from within and without the Department, an additional assistant is needed.

(2) \$1,000 for a messenger, urgently needed in the catalogue room, in labeling and marking the books and doing simple filing. With the increase in the volume of work in the Library, which in turn is based upon the increase in the work of the Department as a whole, it is impossible with the present force to keep the pasting, marking and filing up to date. As a result it is necessary for current operation to have higher paid assistants help in this work. This is uneconomical and results in congestion of more important work.

Project Statement

<u>Project</u>	<u>1929</u>	<u>1930</u>	<u>1931</u>	<u>Increase</u>
Salaries and Expenses	\$95,680	\$102,000	\$105,000	3,000 (1-2)

LIBRARY, DEPARTMENT OF AGRICULTURE (Continued)Activities under this Appropriation

The Department Library is one of the basic units in the research organization of the Department and the state agricultural agencies. With its branch libraries in the various bureaus, containing approximately 210,000 volumes on agriculture and the related sciences, technology, and economics, it is the largest special collection of this kind in the country. It makes this literature readily available through its catalogues and special indexes, numbering more than a million cards, and through special bibliographies. It circulates books and periodicals to Department workers as needed in their work, especially in research, and assists them in gathering references on scientific and economic subjects and problems which are being investigated or are to be investigated. It supplies reference material and bibliographical information needed in answering the various enquiries addressed to the Department and assists the State Agricultural Colleges and Experiment Stations and other scientific institutions through the loan of its books.

In general, it acts as the national agricultural library and as the clearing house of bibliographical information relating to the literature of agriculture in all its phases.

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OFFICE OF EXPERIMENT STATIONS

(a) PAYMENTS TO STATES AND HAWAII FOR AGRICULTURAL
EXPERIMENT STATIONS

Appropriation, 1930.....	\$4,335,000
Budget, 1931.....	4,340,000
Increase.....	5,000

The increase of \$5,000 is to meet the authorization of \$20,000 for 1931 provided in the Hawaii Station Act approved May 16, 1928.

Project Statement

<u>Project</u>	<u>Expended,</u> <u>1929</u>	<u>Estimated,</u> <u>1930</u>	<u>Estimated,</u> <u>1931</u>	<u>Increase</u>
Hatch Act.....	\$ 720,000	\$720,000	\$720,000	----
Adams Act.....	720,000	720,000	720,000	----
Purnell Act.....	2,400,000	2,880,000	2,880,000	----
Hawaii Station Act.....	-----	15,000	20,000	5,000
Total.....	3,840,000	4,335,000	4,340,000	5,000

Activities under this Appropriation

The Hatch Act approved March 2, 1887, appropriates \$15,000 per annum to each State for agricultural experiment stations to "aid in acquiring and diffusing among the people of the United States useful and practical information on subjects connected with agriculture, and to promote scientific investigation and experiment respecting the principles and applications of agricultural science."

The Adams Act approved March 16, 1906, appropriates \$15,000 per annum to each State for the more complete endowment and maintenance of the State agricultural experiment stations "to be applied only to paying the necessary expenses of conducting original researches or experiments bearing directly on the agricultural industry of the United States."

The Purnell Act approved February 24, 1925, authorized an appropriation for each State of \$20,000 for the fiscal year 1926, an increase of \$10,000 over the preceding year for each fiscal year 1927 to 1929, inclusive, and \$60,000 per annum thereafter for the more complete endowment of agricultural experiment stations and for other purposes to be "applied only to paying the necessary expenses of conducting investigations or making experiments bearing

OFFICE OF EXPERIMENT STATIONS (Continued)

directly on the production, manufacture, preparation, use, distribution, and marketing of agricultural products and including such scientific researches as have for their purpose the establishment and maintenance of a permanent and efficient agricultural industry, and such economic and sociological investigations as have for their purpose the development and improvement of the rural home and rural life, and for printing and disseminating the results of said researches."

The Hawaii Station Act approved May 16, 1928, provides that beginning with the fiscal year 1930 the Territory of Hawaii shall be entitled to share in the acts noted above and authorizes appropriations for this purpose as follows: 1930, \$15,000; 1931, \$20,000; 1932 to 1936, inclusive, \$2,000 increase each year over the preceding year; 1937, \$50,000; 1938 to 1941, inclusive, \$10,000 increase each year over the preceding year; and thereafter \$90,000 per year.

(b) SUPERVISION AND RELATIONS WITH AGRICULTURAL EXPERIMENT STATIONS

Appropriation, 1930.....	\$155,000
Budget, 1931.....	169,000
Increase.....	14,000

The increase of \$14,000 is submitted for additional technical and stenographic assistance, travel, and supplies. Much of the increased work made possible for the States through the Purnell Act has been in the newer fields, such as agricultural economics, home economics, agricultural engineering, rural sociology, and genetics. Assistance to the States in planning, coordinating, and correlating research, especially in these newer fields, is greatly needed and is desired by the States. The increased work of the States has also very materially increased the time required for the annual inspections made by this Office and the work of coordinating the work of the Department and the State stations. All these phases of the work require highly qualified technical experts and necessitate a considerable amount of travel and stenographic assistance. The demands that are being made on the Office for advice and assistance in coordinating the work of the several stations and the work of the Department and the stations can not be satisfactorily met with the present limited personnel.

Project Statement

<u>Project</u>	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>	<u>Increase</u>
Supervision and relations with agricultural experi- ment stations.....	\$132,058 ¹ / ₁	\$155,000	\$169,000	\$14,000

¹/₁ \$3,100 additional was transferred to Porto Rico and Virgin Islands stations for use in repairing damage done by hurricane.

OFFICE OF EXPERIMENT STATIONS (Continued)Activities under this Appropriation

The administration of the Federal appropriations for agricultural experiment stations in the States and for the insular agricultural experiment stations with which the Office is charged has grown to be a large and complex enterprise. It involves funds amounting to \$4,340,000 for the States and Hawaii and \$249,000 for the insular experiment stations. The supervision is close and the advisory relations are extensive. The funds are expended on the basis of definite limited projects submitted by the stations in advance for review and acceptance or modification by the Office of Experiment Stations. The work and expenditures of each station are inspected annually, necessitating that from three to five days be spent at each of the fifty stations by a representative of the Office qualified to go into all matters of expenditures and the work in all lines of research.

The number of projects under the several acts has more than trebled since the passage of the Purnell Act in 1925, and as fast as projects are completed new ones are submitted. During the past year 130 projects were completed or brought to a point where they could be terminated, and considerably over 300 new projects were undertaken. In addition, as a result of the annual inspection, many restatements and modifications of existing projects are made. During the last year over 350 projects were so considered with the States and more than 100 were modified or revised. The budgets of the several States for using the different funds are submitted for approval annually and furnish an occasion for checking the justification of continuing the individual projects.

The Federal funds are supplemented by State funds, and a large majority of the projects on Federal funds are supported in a considerable part from State resources. Formerly the supervision of projects and funds was comparatively simple, but the projects have now become more technical and abstract and the research has been extended into new fields, such as genetics, agricultural engineering, agricultural economics, home economics, and rural organization. This necessitates an office force of qualified technical experts recognized as competent to criticize the projects and work and to offer useful advice and suggestions. The State stations look to the Office for this help, and it is a service to a research enterprise which now represents over \$15,000,000 of State and Federal funds.

The net added cost of administration of the Purnell funds has amounted to only approximately one per cent of the increased appropriation to the States.

The supervision of the coordinating of the work of the several State experiment stations and of the Department and the State stations is assigned to this Office. Approximately 1,100 agreements for cooperative projects between one or more bureaus of the Department and one or more State stations are now in force.

For the purpose of assisting the research workers in the stations and the Department, the Office has charge of the preparation of Experiment Station Record

OFFICE OF EXPERIMENT STATIONS (Continued)

for publication. This is a highly technical abstract journal covering the entire field of research in the sciences pertaining to agriculture. Approximately 7,000 abstracts are prepared each year by 12 specialists giving all or part of their time to this work and published in two volumes of nine abstract numbers and one index number each. Of the abstracts, 1,200 to 1,500 cover publications of the State and insular agricultural experiment stations, 300 to 400 cover publications of the Department, and the remainder are abstracts or reports of research done throughout the world.

The Office also, as part of the cooperation between the Department and Biological Abstracts in the preparation of technical abstracts for that journal, provides approximately \$5,300 for the employment of technical and clerical personnel and supplies.

(c) INSULAR AGRICULTURAL EXPERIMENT STATIONS

Appropriation, 1930.....	\$247,000
Budget, 1931.....	249,000
Increase.....	<u>2,000</u>

The increase of \$2,000 is submitted for the following purposes:

(1) \$1,000 for the Guam Agricultural Experiment Station for travel connected with the agricultural extension work and station equipment. The 1930 appropriation made it possible to resume in a limited way the agricultural extension work dropped several years ago because of reduction in the appropriation. It did not, however, provide sufficient funds for both the salary and expenses of an extension agent. The station is also badly in need of additional equipment and also for buildings and runs for the poultry work in progress or contemplated.

(2) \$1,000 for the Virgin Islands Agricultural Experiment Station for use in equipping a laboratory for the veterinarian and animal husbandman and for travel in connection with the control of the cattle tick and the inspection of cattle being shipped to Porto Rico. Quarantine regulations made effective in 1928 stopped shipments of beef cattle to Porto Rico, and it was necessary to add a veterinarian and animal husbandman to the station staff. The increase in the appropriation for 1930 was only sufficient to pay part of the salary of the veterinarian and animal husbandman and left nothing with which to equip his laboratory or pay his travel expenses.

Project Statement

<u>Project</u>	<u>Expended,</u> <u>1929</u>	<u>Estimated,</u> <u>1930</u>	<u>Estimated,</u> <u>1931</u>	<u>Increase</u>
Alaska Stations.....	\$86,475	\$85,000	\$85,000	-----
Hawaii Station.....	54,406	45,000	45,000	-----
Porto Rico Station.....	69,506 ^{1/}	59,000	59,000	-----
Guam Station.....	25,821	29,000	30,000	1,000 (1)
Virgin Islands Station....	29,245 ^{2/}	29,000	30,000	1,000 (2)
	<u>265,453</u>	<u>247,000</u>	<u>249,000</u>	<u>2,000</u>

Activities under this AppropriationGeneral

The agricultural experiment stations in Alaska, Hawaii, Porto Rico, Guam, and the Virgin Islands were established to determine the agricultural possibilities of the different insular parts of the United States, to aid in the improvement and diversification of the agriculture in the possessions, and to develop types of agriculture adapted to each.

Alaska Stations: The Alaska experiment stations were established to develop types of agriculture adapted to that Territory. On account of the extent of the Territory and marked differences in climatic and other conditions, stations are operated in four rather dissimilar regions. The headquarters station is at Sitka in southeastern Alaska where the rugged topography and heavy rainfall make the usual farming operations impracticable. At this station the experimental work consists of investigations of small fruits, vegetables, and ornamentals for the home garden and for commercial growing near the larger towns. Experiment stations are maintained at Fairbanks in the Tanana Valley and at Matanuska in the Matanuska Valley. These stations are about 300 miles apart; the Fairbanks station represents the vast interior valley of the Yukon River and its tributaries, and the Matanuska station an extensive transition area that is intermediate in its climatic conditions between the coast region and the central valley. At both of these stations investigations on crop adaptability and improvement, plant and animal breeding, and the feeding and care of livestock are being given consideration. At the Kalsin Bay station, located about 15 miles from the village of Kodiak on the island of Kodiak, livestock work is in progress with cattle to determine the winter management necessary under range conditions. This region is representative of the treeless region of southwestern Alaska which extends from Cook Inlet to the Aleutian Islands where there are extensive areas of grass lands suitable for summer range but the over-wintering of livestock is somewhat hazardous.

1/Regular appropriation was increased by \$1,300 transferred from "Supervision and Relations with Agricultural Experiment Stations" and \$9,500 in First Deficiency Act, 1929.

2/Regular appropriation was increased by \$1,800 transferred from "Supervision and Relations with Agricultural Experiment Stations" and \$3,000 in First Deficiency Act, 1929.

OFFICE OF EXPERIMENT STATIONS (Continued)

At the Sitka Station there have been developed varieties of strawberries through hybridizing the native wild species with commercial varieties that are hardy, productive, and extensively grown throughout most of the settled parts of the Territory. Superior strains and varieties of other small fruits have been introduced and extensively distributed. Some very promising seedling varieties of potatoes have been developed that are being given wide tests to determine their value in comparison with commercial varieties that were developed under dissimilar conditions. The local growing of bulbs for the propagation of hyacinths, narcissus, tulips, some lilies, etc., has been found practicable.

The adaptability of Galloway cattle to Alaska conditions has been established. In order to produce a better milk type animal crosses have been made between Galloway and Holstein cattle and one of the crossbred cows gave 12,010 pounds of milk in her fourth lactation period. Several second generation cross-breeds gave about 8,000 pounds of milk in their first lactation periods. Crosses between Galloways and the Asiatic yak have been made and the hybrids have proved very hardy at the interior station at Fairbanks.

Cereal breeding and selection work have resulted in varieties of wheat, oats, and barley that are adapted to interior Alaska. The work with forage plants has resulted in the introduction of many superior strains. Recent investigations have shown that grasses and forage plants should be cut earlier than is the local practice. Cutting them in July or early August gave hays of greater nutritive value and the weather at that time is usually more favorable for haying than later in the year. The common belief that native grasses retained their nutritive value when allowed to ripen in the late fall was shown to be erroneous.

Hawaii Station: The Hawaii station, with headquarters at Honolulu, was established to aid in the development of other agricultural industries than sugar production, that industry being already served by an experiment station maintained by the Sugar Planters' Association. For some years experiments were carried on with pineapples, but the establishment of a station by the pineapple growers made it possible for the station to withdraw from that field. The station has turned its efforts to other lines in an effort to assist the so-called small farmers as contrasted with plantation management. Soil and crop work, horticultural investigations, chemical studies of soils, crop utilization, plant breeding, and forage crop studies constitute the principal activities of the station. In cooperation with the Territory, experimental work is in progress in a homestead area at an elevation of nearly 4,000 feet on the Island of Maui.

The station worked out the cause and means of control of pineapple yellows. It was found to be due to the high manganese content of some soils, and spraying the growing plants with iron sulphate proved a perfect control measure. Several thousand acres of land that had been abandoned were replanted with pineapples, and one of the largest companies regularly sprays as an insurance against loss from yellows. As a result of the station's work on the Island of Maui, a commercial planting of nearly 100 acres of pineapples was made in 1928 at an elevation of nearly 1,000 feet above what was formerly considered the limit for this crop. If this venture proves successful a large area will be available for planting.

OFFICE OF EXPERIMENT STATIONS (Continued)

Through the chemical department of the station considerable interest was awakened in the growing of edible canna for starch production and for stock feed. The starch has properties that especially commend it for a number of commercial uses and there are extensive areas adapted to canna growing that are not suited to sugar cane or pineapples.

Extensive soil studies made at the station are the basis for a classification of the soils of the Territory.

Improved methods of jelly- and preserve-making developed by the station have made possible the establishment of a number of small factories for the utilization of surplus fruits.

The horticultural work has resulted in more rapid and successful methods of propagating some of the more important tropical fruits, nuts, and ornamentals. The value of windbreaks in connection with horticultural and other plantings has been shown.

Through the station large numbers of improved varieties of fruits, nut trees, etc., have been introduced and disseminated throughout the Territory.

From the establishment of the station attention has been given to the introduction of forage and pasture plants and large areas are now being occupied by these introduced varieties with the result of a greatly increased carrying capacity of the ranges.

Porto Rico Station: The Porto Rico Station, with headquarters at Mayaguez, was established for the purpose of aiding in the improvement and diversification of the agriculture of the island. Its work is so organized that it does not duplicate that of the experiment station operated in another part of the island by the local government. Its main lines of investigation are connected with livestock improvement, crop improvement, coffee, citrus fruit, and pineapple studies, plant diseases and insect pests, soils and fertilizers, and animal parasites. Cooperative work is carried on in various parts of the island, especially with coffee, citrus, and pineapple growers and with the Public Health Service on the relation of animal parasites to human infection and diseases.

The station has shown conclusively the possibility of greatly improving the livestock of the island by the introduction of improved sires. In connection with the improvement of cattle, it was found that due to the presence of cattle ticks young animals were more readily acclimated than old ones. In connection with cattle improvement work, the station constructed the first dipping tank in the island and the station property was the first area to be cleared of cattle ticks. Experiments in dairying have shown the possibility of producing sanitary milk--a badly needed article in the dietary of the people.

OFFICE OF EXPERIMENT STATIONS (Continued)

The horticultural department of the station has given much attention to the introduction, propagation, and dissemination of improved varieties of tropical horticultural crops. It has also carried on experiments with coffee in which varieties, methods of planting, use of fertilizers, topping, etc., were studied and much valuable information was secured which was of great value in the restoration of coffee plantations after the devastating hurricane of September 13, 1928. Studies were made on the effect of length of day on various plants and this was found to be an important factor and an explanation was found for the failure of many northern varieties of crops when taken into the Tropics.

The studies of citrus and pineapple problems have yielded data on proper selection of stocks, soil relations, methods of planting, use of fertilizers, etc., that are of value to the growers. This information proved very valuable in restoring plantations damaged by the hurricane of September 13, 1928. A large amount of information relating to the methods of packing and shipping fruit has been made available to the producers and shippers.

In the agronomy department, by adopting methods of plant-breeding and adapting them to Porto Rican conditions, high yielding strains of corn have been produced and several excellent varieties of sugar cane have been developed that are resistant to the disease, mosaic, which threatened the sugar industry a few years ago.

The station has been especially successful in its forage crop investigations, and through its efforts many introduced varieties are being extensively grown for forage and cover crop purposes.

The plant pathologist of the station worked out the cause of coconut bud rot in Porto Rico and he superintended an eradication campaign for its control.

The parasitologist has established the fact of the presence of a large number of internal and external parasites of livestock that makes stock-raising less profitable. He has worked out some phases of their life histories and the information is fundamental for the control of some species.

Guam Station: The Guam station was established with the view of improving an agriculture that was very primitive in development. The work has been along livestock improvement, crop production, and pest control, and distinct improvement has been reported.

Through the introduction of improved sires and continued selection, marked improvement has been brought about in the horses, cattle, and swine of the island. Experiments in feeding coconut meal, a product left after the oil is extracted, have shown it to be a valuable feeding stuff and it can be profitably substituted for one-third to one-half of the grain ration, much of which is imported. The native method of feeding raw coconut to animals was found to be wasteful and uneconomical.

OFFICE OF EXPERIMENT STATIONS (Continued)

Considerable progress has been made in the development of a breed of poultry that has the hardy qualities of the so-called native birds and also the greater egg production of the White Leghorns.

The forage plant introduction work has proved to be exceedingly valuable. Introduced grasses and other forage plants proved so superior to the native species that they are now widely planted.

A considerable number of varieties of vegetables and fruit crops have been introduced by the station and, when found adapted to local conditions, they have been given wide distribution, with the result that many are now to be found in the local markets. Plant-breeding experiments for their further improvement are in progress.

Investigations have been begun and successful results attained in the propagation of some valuable native fruits that were threatened with extinction.

Varieties of tropical root crops such as yams, sweet potatoes, taro, and cassava have been introduced that are more productive and of better quality than the local ones, and the station is propagating such material for wide distribution. The station is the only source of supplies for improved planting material and it has difficulty in supplying the requests it receives.

The station, through the efforts of the entomologist, has brought about a biological balance between the coconut scale and its parasites so that the danger of the destruction of the coconut trees seems to have been averted. Predacious and parasitic insects of other insect pests are being bred and liberated in large numbers for the control of other pests.

Agricultural extension work is conducted on a limited scale. The young people, especially the school children have evidenced a marked appreciation of this work and it is believed to be the best means of approach to the ultimate improvement of the agriculture of the island. Through this activity the employment of modern implements has, to some extent, succeeded the use of hand implements in the cultivation of crops.

Virgin Islands Station: The Virgin Islands station at St. Croix, which was acquired with the purchase of the islands from Denmark, is engaged in an effort to improve the agricultural condition of the islands and relieve the situation brought about by changed economic conditions. It is carrying on work with field crops, horticulture, and animal husbandry.

The station has been very successful in its sugar cane breeding experiments. One seedling variety, S C 12/4, has proved of great value for growing without irrigation. It is the leading variety now planted in St. Croix and is extensively planted in Porto Rico, Cuba, and other West Indian islands. It is somewhat resistant to mosaic and has other valuable field characters. The station is continuing this line of work and it has other seedlings that are still more promising from the standpoint of sugar production.

OFFICE OF EXPERIMENT STATIONS (Continued)

Considerable attention has been given to corn breeding experiments to develop high yielding tropical strains and to Sea Island cotton for resistance to diseases and insect attack. Some very promising results with corn have been secured.

For several years attention has been given to the production of new seedling varieties of sweet potatoes, and several have been developed that out-yield and are of better table quality than the present type. This experiment is being continued and by crossing varieties some disease resistance is being sought, in cooperation with the Bureau of Plant Industry. The Virgin Islands seem to be one of the regions where seeding is common with sweet potatoes. They never produce seed on the mainland.

In horticulture efforts are being made to introduce better varieties of fruits and vegetables and to improve cultural methods in an attempt to induce their wider growing for home consumption. Considerable success has been met with and the markets afford larger and better supplies than formerly. An experiment in growing Bermuda onions, tomatoes, and peppers as winter crops has been in progress for several years, but owing to transportation and other difficulties the experiment has not been entirely successful. It did result in largely increased supplies for local consumption.

An experiment is in progress in reforesting some of the nonproductive areas in the islands and a number of very promising species of forest trees have been found as a result of extensive miscellaneous plantings.

In animal husbandry, stock improvements by the introduction of improved sires has received quite an impetus through the activities of the station.

Stock-raising is second in importance among the agricultural industries of the islands. Extensive shipments of beef cattle to Porto Rico were stopped by quarantive regulations. With the appointment of a veterinarian, who directs the dipping of the cattle under regulations, shipments can now be certified to as free from cattle ticks and their exportation is permitted.

The station is carrying on demonstration work in agriculture on the islands of St. Thomas and St. John, and the people are rapidly adopting the cultivation of vegetables for home use and are sending their surplus to market. Many of these people had to be taught the most elementary operations of planting and tending to crops. Their previous livelihood was gained about the docks and warehouses of St. Thomas. There is not the demand there once was for labor of this type, and the people were in very straightened circumstances.

Change in Language

The language of this paragraph has been amended by omitting from the proviso relating to the construction of buildings in Alaska, the word "immediately," as the necessity for retaining this word is no longer required.

EXTENSION SERVICE

Payments to States, Hawaii, and Alaska for agricultural extension work.

General Statement

Act	1930	Estimated 1931
Smith-Lever Act of May 8, 1914	\$4,602,936	\$ 4,602,936
Annual Agricultural Appropriation Act, (Supplemental Smith-Lever)	1,580,000	1,580,000
Capper-Ketcham Act of May 22, 1928	1,480,000	1,480,000
Act of February 23, 1929, (Alaska)	-----	10,000
<hr/>		
Total payments made directly to States ...	\$ 7,662,936	\$ 7,672,936
<hr/>		
<u>Amounts allotted to States but disbursed by Department of Agriculture:</u>		
<hr/>		
Farmers' Cooperative Demonstration Work ..	\$ 984,000	\$ 1,024,940
Act of January 26, 1928 (Flood devastated farm area relief)	60,000	-----
Act of June 7, 1924, Clarke-McNary Act (Farm Forestry)	59,000	64,000
<hr/>		
Total allotments to States by Department	\$ 1,103,000	\$ 1,088,940
<hr/>		
Total of direct payments to States and allotments to States:	\$ 8,765,936	\$ 8,761,876
<hr/>		

Direct payments to the States, Hawaii, and Alaska for cooperative extension work are included in four appropriation items, (1) the regular Smith-Lever appropriation of \$4,602,936, a permanent annual appropriation which does not require action by the Congress; (2) the Supplemental Smith-Lever appropriation of \$1,580,000; (3) the appropriation authorized by the Capper-Ketcham Act, \$1,480,000; and (4) the appropriation authorized by the Act of February 23, 1929, extending the provisions of the Smith-Lever Act to the Territory of Alaska, for which an initial estimate of \$10,000 is made for the fiscal year 1931.

The appropriation under the first three items for the fiscal year 1930 is \$7,662,936, of which \$30,000 goes to each State and Hawaii without offset requirement, a total of \$1,470,000, and the remainder, \$6,192,936, is divided among the States and Hawaii in the proportion that the rural population of each bears to the total rural population of the United States and Hawaii. These additional allotments are available only when offset with

EXTENSION SERVICE (Continued)

like amounts from within the States. The estimate for 1931 is identical with the appropriation for 1930, except for the inclusion of \$10,000 for extension work in Alaska.

In addition to these appropriations paid directly to the States, the Department allots to the States for extension work approximately \$1,103,000, of which \$984,000 is out of the appropriation "Farmers' Cooperative Demonstration Work", \$59,000 from the Clarke-McNary farm forestry item, and approximately \$60,000 of the unexpended balance of the special appropriation for the employment of extension agents in areas affected by the floods in 1927.

The total of all these Federal funds allotted to the States for extension work for the fiscal year 1930 is \$8,765,936, and the total of all extension funds from within the States is \$15,006,038. Federal, State and local funds together make a grand total of \$23,771,974 available for extension work in 1930.

The extension personnel in the States on July 1, 1929, consisted of 5,691 persons, an increase of 530 during the year. Of this number, 4,170 were located in the counties, of whom 2,452 were county agricultural agents or assistant agents, 1,167 were home demonstration agents, 252 were engaged in boys' and girls' club work, and 299 in negro extension work. The work of the county extension agents was supplemented by the services of 825 full-time and 212 part-time subject matter specialists, located at the State agricultural colleges. The staff of administrative officers, supervisors, and assistant supervisors numbered 484. During the year there was an increase of 495 county workers, 33 subject-matter specialists, and 2 administrative and supervisory workers. Of the 495 new county workers, 145 were agricultural agents or assistant agents, 243 were home demonstration workers, and 106 were club agents. The Office of Cooperative Extension Work in the Department of Agriculture, through which general supervision is given to cooperative extension work in the States, has a staff of 9 administrative and supervisory officers, 13 organization field agents, and 15 subject-matter specialists.

The following tabulation indicates the funds for payments to the States for 1930 and estimated for 1931:

(a) COOPERATIVE AGRICULTURAL EXTENSION WORK
(Supplemental Smith-Lever)

Appropriation, 1930	\$1,580,000
Budget, 1931	1,580,000

Project Statement

	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>
Supplemental Smith-Lever Funds	\$1,580,000	\$1,580,000	\$1,580,000

EXTENSION SERVICE (Continued)Activities Under this Appropriation.

These funds supplement the permanent annual appropriation of \$4,602,936 provided under the Smith-Lever Act (May 8, 1914, 38 Stat. 372-374 U. S. C. 114). Like the Smith-Lever funds, they are paid direct to the State colleges of agriculture as Federal aid for the promotion of extension work in agriculture and home economics. Programs of work and expenditures from Federal Smith-Lever funds are supervised by the Department of Agriculture. This appropriation is divided among the States and Hawaii in the proportion that the rural population of each bears to the total rural population of the States and Hawaii, and is available only when offset with funds from within the States. This item contains a provision that not more than \$300,000 may be expended for purposes other than salaries of extension agents in counties. As \$300,000 is approximately 19 per cent of the total appropriation, this is equivalent to a requirement that approximately 81 per cent of the State allotments must be expended for salaries of county extension agents.

(b) COOPERATIVE AGRICULTURAL EXTENSION WORK.

(Capper-Ketcham)

Appropriation, 1930	\$1,480,000
Budget, 1931	1,480,000

Project Statement

<u>Project</u>	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>
Capper-Ketcham			
Funds	\$980,000	\$1,480,000	\$1,480,000

Activities under this Appropriation.

This appropriation is specifically authorized by the provisions of the Act of May 22, 1928 (45 Stat. 711,712) known as the Capper-Ketcham Act. This Act authorizes an appropriation of \$980,000 to be divided at the rate of \$20,000 to each State and to Hawaii, without requirement for State offset, and of an additional \$500,000 to be divided among the States and Hawaii on the basis of rural population. It further provides that at least 80 per cent of the funds appropriated under this authorization shall be expended for salaries of county extension agents. The State allotments are paid directly to a designated officer in the State and are disbursed in accordance with budgets and plans of work submitted by the State directors of extension and approved by the Secretary of Agriculture. Expenditures by the States from this and other cooperative extension appropriations are subject to an annual inspection by representatives of the Department.

EXTENSION SERVICE (Continued)(c) EXTENSION OF SMITH-LEVER ACT TO ALASKA.

Appropriation, 1930	-----
Budget, 1931	\$ 10,000
Increase	\$ 10,000

Project Statement.

<u>Project</u>	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>	<u>Increase</u>
Cooperative extension work, Alaska	-----	-----	\$10,000	\$10,000

This is a new item specifically authorized by the Act approved February 23, 1929, "An Act to extend the benefits of the Hatch Act and the Smith-Lever Act to the Territory of Alaska". (U.S.C. Supp. III, title 7, sec. 386c) \$10,000. This act authorized the extension of the Hatch Act, for Federal aid to experiment stations, and the Smith-Lever Act, for Federal aid for extension work, to the Territory of Alaska, under certain specified conditions. This item has to do only with carrying out the provision extending the Smith-Lever Act to Alaska.

Activities under this Appropriation.

This appropriation will provide sufficient funds for the employment of an agricultural agent and a home demonstration agent in Alaska, and a part of the necessary funds for travel. It will be supplemented by appropriations made by the Territory of Alaska, or by funds from the Alaska College of Agriculture, which will be used for the remaining necessary travel funds, stenographic help, and supplies. The extension work in agriculture and home economics which will be done will be of a similar nature to that which is being conducted in the States, modifications being made to suit local conditions. Experiment stations have been maintained by the Federal government in Alaska for many years but practically no extension work has been done among farmers. Because of the difficulties of travel and the isolation of many of the farmers, they are not advised as to the experimental results which have been obtained. Extension work will take these results to the farmers, thus making them generally applicable. There is need also for a trained home demonstration worker who can be of assistance to the home makers in Alaska and who can conduct club work with girls.

New Language

Appropriate language for this item has been inserted in its proper place under the Extension Service.

EXTENSION SERVICE (Continued)(d) GENERAL ADMINISTRATIVE EXPENSES.

Appropriation, 1930	\$12,000
Budget, 1931	<u>15,000</u>
Increase	\$ 3,000

This is an apparent increase of \$3,000 by transfer from the appropriation for "Farmers' Cooperative Demonstration Work," which item has been reduced accordingly.

The \$3,000 will be used for the employment of one additional clerk in the personnel section to keep current the increased personnel work, and for additional travel of the Director. The transfer is provided for in order that these administrative expenses may be paid as far as possible from one fund.

Project Statement

	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>	<u>Increase</u>
General Adminis- trative Expenses	\$12,052	\$12,000	\$15,000	\$3,000

Activities Under this Appropriation.

This appropriation covers the general expenses of the Office of the Director of Extension Work, except the Director's salary, which is paid by the Office of the Secretary. The principal items of expense are for the clerical staff of the Office, including a personnel section which handles all the personnel papers of the Extension Service, and for the Director's travel.

(e) FARMERS' COOPERATIVE DEMONSTRATION WORK.

Appropriation, 1930	\$ 1,495,000
Budget, 1931	<u>1,550,000</u>
Increase	\$ 55,000

This is an apparent increase of \$55,000, but an actual increase of \$58,000, since \$3,000 was transferred to the item for "General Administrative Expenses."

EXTENSION SERVICE (Continued)

The increase of \$58,000 is needed for the employment of extension specialists in agricultural economics and cooperative marketing. In recent months there has been a greatly increased demand for service to cooperative marketing associations and particularly for educational work in bringing before the farm public the principles and advantages of cooperative marketing, as well as presenting to them economic information which will enable them to obtain a better return from their crops and livestock.

The investigations of the Bureau of Agricultural Economics and of the State experiment stations are producing much information on foreign and domestic supplies and demands for agricultural products, price trends, the agricultural outlook intentions of farmers to plant crops and breed livestock, and other data which affect prices. This information needs to be localized and brought more effectively to the attention of farmers. In general, county agricultural agents are not specially trained in agricultural economics and without the assistance and direction of extension specialists in this field, cannot utilize economic information to the best advantage. The increased interest in cooperative marketing, due to the creation of the Federal Farm Board and the desire on the part of that organization for an extensive educational campaign on cooperative marketing by the Extension Service makes it necessary to expand materially the extension activities in the marketing field. Because State legislatures generally met last winter and will not meet again until 1931, the States have little opportunity for increasing their extension marketing budgets. Many of them, however, will be able to contribute small amounts toward the employment of extension specialists in this field, or to pay travel expenses. The States are now employing 47 full-time marketing extension specialists and 16 part-time specialists, but 20 of the States are not doing any work in this field, except as it may be done incidentally by the directors or other extension workers charged primarily with other duties.

It is intended that part of the increase of \$58,000 will be used for employment of extension specialists in marketing in Washington and provide for their travel expenses, and that the remainder will be used for employment of marketing specialists, to be assigned to specific States, with a part of the expense to be paid from State funds. On this basis the average cost of the specialists from this appropriation should not be more than \$3,000.

Project Statement.

	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>	<u>Increase</u>
Farmers' Cooperative				
Demonstration Work...	\$1,468,564	\$1,495,000	\$1,550,000	\$55,000

Activities Under this Appropriation

General

This appropriation is used for financing the Office of Cooperative Extension Work, the Office of Motion Picture, the Office of Demonstrations on Reclamation Projects, and for direct payments to States on salaries of extension agents. The allotment for 1930 to the Office of Cooperative Extension

EXTENSION SERVICE (Continued)

Work is \$447,940 to Office of Motion Pictures, \$63,060; Demonstrations on Reclamation Projects, \$39,255; and to the States, \$944,745.

By far the larger part of the 5,691 State and county extension workers are under Federal appointment, either without compensation, or paid at rates running up to \$50.00 per month. The compensation of these workers from Federal sources is arranged by the State directors of extension out of allotments made to the States from this appropriation, at the beginning of the fiscal year. Through this allotment of approximately \$944,000 these extension agents are made employees of the Federal Government as well as of the States and counties.

The Office of Cooperative Extension Work examines and recommends for approval budgets and plans of work submitted by State directors of extension, involving the expenditure of Federal and State offset funds; makes an annual examination of extension expenditures in each of the States; and gives general supervision to cooperative extension work. It employs subject-matter specialists who represent the bureaus of the Department in their contacts with the State extension forces, receives and tabulates annual reports from all extension agents, and prepares press material and reports on extension work.

The Office of Motion Pictures, in cooperation with the subject-matter bureaus, prepares motion pictures illustrative of the various phases of the Department's work and makes these pictures available to the public through extension workers and other Department employees, vocational teachers, and other agencies. Nearly 250 different motion picture films have been prepared by the Department, the production of new films each year covering 20 to 25 subjects. The staff of the office includes scenario writers and editors, directors, photographers, and laboratory workers.

The Office of Demonstrations on Reclamation Projects, with headquarters in Salt Lake City, cooperates with State extension services in the employment of extension agents in counties which include reclamation projects. The work of these agents is practically identical with that of other extension workers, their activities, of course, being directed especially toward successful farm operations on irrigated land. Because of the special interest of the Government in reclamation projects, more than the usual share of the expense of maintaining these agents is paid from Federal sources, this being the allotment from which such payments are made.

(f) AGRICULTURAL EXHIBITS AT FAIRS.

Appropriation, 1930	\$120,000
Budget, 1931	120,000

Project Statement

<u>Project</u>	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>
Agricultural Exhibits at Fairs	\$108,628	\$120,000	\$120,000

EXTENSION SERVICE (Continued)Activities Under this Appropriation

This appropriation provides for agricultural exhibits at State, interstate, and international fairs within the United States. The cost of planning, construction, and demonstration of the exhibits is paid by the Department, while the State and interstate fairs, through a cooperative arrangement, finance the cost of transportation, local movement at exhibition points, and installation expenses. Each year displays are made at some 40 State and interstate fairs, the usual unit of display being a carload shipment. At national expositions such as the National Dairy Show and the International Live Stock Exposition, two carloads of exhibits, many of them specially prepared, are usually shown. In addition, in cooperation with the subject matter bureaus, exhibits are often arranged at conventions and other important gatherings of persons interested in some phase of the Department's work. The Office of Exhibits is the organization which prepares and demonstrates Departmental exhibits at international fairs outside the United States, when specific appropriation is made by the Congress for that purpose.

(g) FOURTH WORLD'S POULTRY CONGRESS

Appropriation, 1930 (Sec. Def. Act, 2d Sess.,
70th Congress)\$25,000
Budget, 1931 -

New language

No appropriation is requested for 1931 for the Fourth World's Poultry Congress which is to be held in London in July, 1930, but the language submitted in the Budget is necessary in order to make the appropriation available during the fiscal year 1931. The exhibit will be completed in the fiscal year 1930, but its installation, showing in London, and return to the United States, together with travel expenses of such demonstration personnel as may accompany it, will, of necessity, be charged against 1931 funds.

(h) COOPERATIVE FARM FORESTRY

Appropriation 1930 .
Facial\$60,000
1928 unexpended balance reappropriated for 1930 5,000
Total available, 1930 65,000
Budget, 1931 70,000
Increase 5,000
(Apparent increase 10,000)

The increase of \$5,000 is submitted for the purpose of expanding the work in farm forestry extension to additional States, the present funds being entirely allotted. Several States, not now cooperating in this work, are expressing interest in such cooperation, Indiana in particular, Oklahoma, which at present employs an extension forester on a half-time basis desires to employ a full-time man. Kentucky is interested in the employment of an extension forester, and other States, are endeavoring to arrange their budgets to provide the necessary funds. Apparent increase \$10,000.

EXTENSION SERVICE (Continued)Project Statement

	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>	<u>Increase</u>
Cooperative Farm Forestry	\$53,481	\$65,000	\$ 70,000	\$5,000

Activities Under this Appropriation

This appropriation, which is authorized by Section 5 of the Clarke-McNary Act, (U.S.C. pp 427, 428, Secs. 564-570), is used for the employment of an extension forester, representing the Forest Service and the Office of Cooperative Extension Work, and for cooperation with the States in the employment of extension foresters. The usual arrangement is for the Federal Government to contribute \$1,980 toward the salary of the extension forester, the State providing for the remainder of his salary, State travel expense, clerical help, and other necessary expenses. Usually the State contribution is considerably more than that of the Federal Government. At present this cooperative arrangement is in effect with 33 States, Hawaii, and Porto Rico. A very large part of the farm acreage of the United States is in wood land and much of the income of farmers in certain sections, particularly the Northeastern and Southern States, is from forest products. County agents generally are not trained in forest management and need the assistance of farm forestry specialists in strengthening their work in this field. The extension forester arranges demonstrations in wood lot management, selection of trees for cutting, estimating of merchantable timber, and in other fields. In many States the extension forester is also active in assisting farmers in forest planting plans, and in interesting members of boys' and girls' clubs in tree planting.

(i) COOPERATIVE AGRICULTURAL EXTENSION WORK
(Permanent Annual)

Appropriation, 1930	\$4,602,936
Budget, 1931	4,602,936

Project Statement

	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>
Cooperative Agricultural Extension Work	\$4,602,936	\$4,602,936	\$4,602,936

Activities Under this Appropriation

This is a permanent annual appropriation for cooperative extension work, provided in the Smith-Lever Act of May 8, 1914, as amended by the extension of this Act to the Territory of Hawaii by the Act of May 16, 1928. Under the provisions of these Acts, \$10,000 is appropriated annually to each State and Hawaii, without requirement for State offset, in addition to which

EXTENSION SERVICE (Continued)

the States and Hawaii, share in an annual appropriation of \$4,112,936 in the ratio which the rural population of each bears to the total rural population of the United States and Hawaii. This is the basic act under which cooperative extension work is conducted by the Department and the State colleges of agriculture. Extension funds and personnel have been discussed in previous paragraphs.

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Note.-- Also see Miscellaneous Section for "Collection of Seed Grain Loans".

WEATHER BUREAU(a) GENERAL ADMINISTRATIVE EXPENSES

Appropriation, 1930,.....	\$ 136,000
Budget, 1931,.....	136,000

Activities under this AppropriationGeneral

General administration of the Bureau is centralized in Washington, D. C., and is provided by this appropriation.

(b) GENERAL WEATHER SERVICE AND RESEARCH

The item for "General Weather Service and Research" as submitted is a consolidation of the two appropriations for general weather service heretofore carried separately as "In Washington" and "Out of Washington". The Weather Bureau is the only branch of the Department which has had such a division in its Appropriation. The maintenance of the general service in two separate appropriations has entailed considerable unnecessary accounting and has made the presentation of the annual estimates increasingly confusing in that for each object of expenditure two separate considerations have been necessary. Project statements also have been only partially informative in that it has been necessary to consult two tables in order to ascertain figures applicable to each individual item. The presentation of the general weather service in one appropriation item will eliminate this confusion. Expenditures in Washington are now limited, as to their most important phase, by the D. C. Salary limitation on the Weather Bureau as a whole.

Appropriation, 1930:

Facial, In Washington.....	\$ 364,000
Out of Washington.....	2,120,000
Total.....	\$2,484,000
Deduct for transfer of custody of Seacoast	
Telegraph Lines to Coast Guard and funds	
for maintenance.....	10,000
<u>Total Available, 1930</u>	<u>2,474,000</u>
Budget, 1931.....	2,530,000
Actual increase.....	56,000
(Apparent increase.....	46,000

WEATHER BUREAU (Continued)

The increase of \$56,000 is submitted for the following purposes:

(1) \$10,900 to meet urgent needs of the three important projects "Meteorological Observations and Reports", "Forecasts and Warnings", and "Climatology". These nation-wide meteorological activities, rendering essential service in the protection of property, and at times life, from frost, cold waves, floods, storms and hurricanes, are dependent upon the maintenance of a large field organization, including more than 200 stations manned by commissioned personnel. The Bureau is charged with the custody and preservation of valuable observatory buildings at 41 of these stations. The rigid economy of the last few years, however, has not permitted the Bureau to maintain its buildings in first class condition and depreciation has been heavy. Painting and exterior repairs are urgent now to prevent still greater costs in the future. Furniture, fixtures, and office equipment at many stations are in need of immediate replacement. It is planned to expend approximately \$6,000 for repairing Weather Bureau buildings and \$4,900 for purchase of supplies, furniture and office equipment for stations most in need.

(2) \$2,800 for employment of a chartman at Washington, D. C. Assistance is required in the preparation of twice-daily Northern Hemisphere weather maps, which are essential in forecasting, particularly in connection with oceanic navigation by water and by air. Demands for information of world-wide meteorological conditions are steadily growing and the number of reports over the principal oceans and foreign countries of the Northern Hemisphere increasing. The present force cannot plot these charts with sufficient rapidity and sufficient detail to make them available to the forecaster.

(3) \$15,600 for improvement and extension of forecast and warning service. A vital and acute need confronts the Weather Bureau in connection with its most important project, "Forecasts and Warnings". The rapid expansion in the work of the Weather Bureau during the past three years due to the fruit-frost, weather observation distribution, fire-weather and aviation programs (especially the latter) has created a situation in regard to forecasters which is serious. Most of these activities require a considerable number of employees with ability in forecasting. Difficulty has been encountered in filling the positions and in many instances it has been necessary to assign to such work employees who, although the best obtainable, were not sufficiently experienced and otherwise qualified to render the best possible service. The Weather Bureau is compelled to draw on its own personnel for the positions in question and will be for a considerable time to come. There are no extra-government institutions or organizations having meteorological work from which trained men can be recruited and only a few educational institutions have courses in the subject. Even if graduates of colleges having meteorological courses were available they still would be untrained in forecasting. The item contemplates the employment of six men at \$2,600 per annum, to be given the intensive training and practical work necessary to qualify as local forecasters.

WEATHER BUREAU (Continued)

(4) \$2,200 for improving and standardizing climatological service. Assistance is urgently required to effect improvements in methods of compiling statistics of climate and in standardizing their publication so as to secure more complete and accurate presentation of the large amount of these statistics collected and distributed by the Weather Bureau in response to the rapidly growing public demands. This is considered an important measure of ultimate economy.

(5) \$5,300 for extension of the corn and wheat region service into Washington, Oregon, and Idaho. Activities conducted under the project "Agricultural Meteorology" include the maintenance of a corn and wheat region service carried on for many years in the principal grain producing areas east of the Rocky Mountains at an approximate current cost of \$20,000 per annum. It is prosecuted by the issue of bulletins based upon observations and reports from minor stations established for the purpose and provides accurate and early information to growers and the trade concerning weather and crop conditions affecting grain production. An essential need for similar service in the far Northwest has resulted in the continual receipt of many urgent requests from grain interests in Washington, Oregon, and Idaho for the inauguration of the work in those states which have become increasingly important grain producers during recent years. This extension of the Corn and Wheat Service should not be delayed.

(6) \$12,200 for strengthening of the River and Flood Service. Expansion of the Bureau's river and flood work is essential to meet requirements which have developed from increased utilization of waterways with the country's growth. This need becomes at this time of especial importance in connection with Mississippi flood control in connection with which great engineering programs are under way. These demand the special attention of this project for intensive service over the Mississippi drainage area in the protection of life and property. Establishment of a moderate number of new river gaging stations and many additional rainfall measuring stations is necessary and will permit not only of more accurate flood warnings but also result in the more effective operation of navigation on our inland waters. Employment of a hydrologist in Washington, D. C., is an important part of the service here contemplated in addition to establishment of minor stations in the field.

(7) \$2,000 for the compilation and study of ocean temperatures and their effect on the climate of adjacent land areas. The Bureau has been collecting observations of surface water temperatures from vessels at sea for many years and has a large volume of material available for study. More is coming in constantly. There is real need to put a competent, trained man on the task of compiling and studying these data. The meteorological influence of the oceans, occupying nearly three quarters of the earth's surface, is very great. The interchange of warm and cold water is continuous but variable. Some years more ice is released from polar regions and cools much greater areas of ocean water in lower latitudes. The temperatures of the tropical seas are known to vary also. Study of these factors is necessary as a promising aid to applied meteorology.

WEATHER BUREAU (Continued)

(8) \$5,000 for the extension of the forest fire-weather warning work. This increase is required and presented in order to put into effect recommendations of the Forest Fire Protection Board in conformity with the provisions of the McNary-McSweeney Act. The estimate contemplates preliminary work looking to the establishment of an additional fire-weather district and in strengthening the organization in the Seven districts now in operation. The work conducted under this project during the past three years, with an estimated cost of \$30,240 in 1930, has been so successful as to have resulted in urgent demands for similar service elsewhere and for more adequate service in the districts now in operation. Available funds have not been sufficient to give nearly as complete service as is needed. The need for greater protection for the large forests of the country is vital in the interest of preserving one of the country's most valuable resources.

Project	Project Statement			Increase
	Expended,	Estimated,	Estimated,	
General Weather Service and Research:	1929	1930	1931	
Meteorological Observations and Reports,.....In	\$ 110,894	\$ 115,600	\$ 115,600	\$ ---
Out	741,114	737,710	741,810	4,100 (1)
Total	852,008	853,310	857,410	4,100
General Forecasts and Warnings, In	69,284	72,210	75,010	2,800 (2)
Out	479,855	483,120	503,120	20,000 (1-3)
Total	549,139	555,330	578,130	22,800
Climatology,.....In	88,490	92,190	94,390	2,200 (4)
Out	554,600	561,710	564,110	2,400 (1)
Total	643,090	653,900	658,500	4,600
Agricultural Meteorology.....In	19,205	20,060	20,060	---
Out	57,836	57,960	63,760	5,300 (5)
Total	77,041	78,020	83,820	5,300
River and Flood Service,.....In	21,815	22,770	25,970	3,200 (6)
Out	184,112	185,450	195,950	9,000 (6)
Total	205,927	208,220	221,920	12,200
Marine Meteorology,.....In	20,896	31,950	33,950	2,000 (7)
Out	26,743	51,810	51,810	---
Total	47,639	83,760	85,760	2,000
Forest Fire-Weather Warning Service.....Out	25,180	30,240	35,240	5,000 (8)
Solar Radiation..... In	8,900	9,220	9,220	---
Erection of Building, San Juan, P. R.,..... Out	2,100	42,900	---	---
Total, In Washington	339,484	364,000	374,200	10,200
Total, Out of Washington	2,071,540	2,150,900	2,155,800	45,800
Total.....	\$2,411,024	\$2,514,900	\$2,530,000	\$56,000

WEATHER BUREAU (Continued)Activities under this Appropriation
General

The major activities of the Bureau, with one exception, are conducted under this appropriation and consist, basically, of the collection and dissemination of meteorological data and of the issuance and distribution of meteorological forecasts, warnings, and advices. They are administered by project leaders stationed at Washington, D. C., through the agency of a large field organization embracing more than two hundred permanent field headquarters located in every State of the Union, and elsewhere, and several thousand minor and cooperative stations with similar widespread geographical distribution.

Meteorological observations and reports: This project of work is a fundamental activity upon which all other projects of the Bureau are dependent to some extent, however specialized. Regular observations, instrumental and visual, of the several elements of meteorological conditions, such as barometric pressure, temperature, rainfall, wind direction and velocity, cloudiness, etc., are taken regularly at all stations twice-daily at 8:00 a.m., and 8:00 p.m., E. S. T., and after being coded and forwarded by telegraph to New York and Chicago by means of a special system recently devised by the Weather Bureau and The Western Union Telegraph Company working in collaboration, are redistributed to stations as required throughout the country, all in less than 45 minutes. When special conditions warrant, observations at other times may be taken and forwarded to a designated center from selected points. The meteorological information contained in the observations is disseminated both locally at points of origin and elsewhere as required to meet public needs.

General Forecasts and warnings: Meteorological data secured from observations are tabulated twice-daily by expert chartmen and arranged to permit study and interpretation by experienced forecasters at District forecast centers located at Washington, D. C., Chicago, Ill., New Orleans, La., Denver, Colo., and San Francisco, Calif., at which forecasts and warnings of general surface and upper air weather conditions and of frost, cold waves, storms, and hurricanes, are issued by districts for the entire United States. Supplementing this work there are prepared local and specialized forecasts at both district centers and local forecast stations in the field to serve a number of widely different interests, such as shippers of perishable goods, concrete construction companies, street cleaning departments, water power companies, and others.

Climatology: Under this head the Bureau utilizes for purposes of permanent record its great body of observational data, collected by thousands of cooperative observers as well as its regular field personnel distributed throughout the entire United States. Tabulation of daily meteorological values and their summation and interpretation by qualified Climatologists, enable the presentation of a complete climatology of the country through the issue of monthly and annual bulletins. This record becomes correspondingly more valuable with the increase in number of years maintained. Climatological summaries are prepared in numerous forms to serve the needs of individuals, corporations, research workers and educators, as well as the general public.

WEATHER BUREAU (Continued)

Agricultural Meteorology: To meet the need for authentic current information as to weather conditions prevailing over the principal agricultural sections of the country, from day to day and week to week, special weather services are maintained during the growing season of the principal crops. Observations are made each morning at some 400 places in the grain and cotton areas and these are collected by telegraph, prepared in bulletin form, and released within three hours. Thus farmers, and all others interested in the growth of crops as affected by the weather, are advised at frequent intervals of prevailing conditions. A weekly service is also maintained for each State and for the country as a whole whereby bulletins are published giving general summaries of the weather for the week as a whole and its effect on crop growth and farming operations in general; also special weekly bulletins are published showing weather conditions over the great grazing areas of the West as affecting the range.

River and Flood Service: This project provides, by means of river gage readings at selected points, an authoritative record of daily river stages on the principal navigable inland waters for use of navigators and numerous interests located contiguous to the rivers. Reports from many hundreds of rainfall stations situated throughout the important river drainage basins enable precipitation data to be obtained which, in conjunction with river stage observations, permit the issuance of river stage and flood forecasts covering a considerable period in advance. Mountain snowfall measurements in the West are conducted as a part of this activity and upon them are based estimates of the quantity of water available for irrigation, hydro-electric power production and municipal water supply.

Marine Meteorology: Under this activity the Weather Bureau collects observations from ships at sea for the purpose of determining weather conditions over the oceans. Observations are made by masters and officers of the world's merchant marine, all nationalities cooperating, without compensation, but receiving Pilot Charts and other publications free of cost. The data collected are charted, compiled and studied in the interest of navigation and meteorology and form the basis of the meteorological information published on the Pilot Charts, issued by the Hydrographic Office, Navy Department, in cooperation with the Weather Bureau, under provision of the Act of Congress approved June 16, 1910. During the last year, in addition to the regular program of work, the Bureau completed the revision of data for the vessel route between the Pacific Coast ports of the United States and the Panama Canal, for publication on the Pilot Charts, and began a similar compilation of data for the Mediterranean Sea. It also furnished, for the same charts, descriptive articles on meteorological subjects of interest and value to seamen.

Forest Fire-Weather Warning Service: For aid in preventing the inception and spread of forest fires, specialists are being employed in the heavily forested areas of the far Western States, the Upper Lake Region and New England. Surveys are made for determination of topography, elevation, ground

WEATHER BUREAU (Continued)

covering, etc., as these affect wind direction and force and atmospheric humidity, and for the establishment and equipment of reporting stations necessary to furnish data of current local meteorological conditions. The foregoing preliminary work is followed by intensive, localized forecasts and warnings concerning meteorological conditions in their relation to the fire hazard.

Solar Radiation: Investigations in solar radiation included measurements of the intensity of the radiation, or heat energy, received at the surface of the earth directly from the sun and diffusely from the sky; the construction and standardization of apparatus for such measurements; studies of the depletion of solar radiation by the gasses, including water vapor, and the dust of the atmosphere; finally, the expenditure of the radiation that reaches the surface of the earth, including its effect upon air temperature. The investigation is from its nature international in scope, and every effort is made to correlate the investigations of the Weather Bureau with those conducted by other agencies not only in the United States but in all parts of the world.

New Language

New language to cover the consolidation of the subappropriations "In Washington Expenses" and "Out of Washington Expenses" has been inserted in its proper place in the section pertaining to the Weather Bureau.

(c) HORTICULTURAL PROTECTION

Appropriation, 1930:

Facial.....	\$33,400
Balance available, 1930, for extension of fruit-frost service into Florida and Alabama, provided by	
Second Deficiency Act, 1929,.....	7,000
Total available, 1930,	40,400
Budget, 1931,	40,400
Actual increase,	- - -
(Apparent increase,	7,000)

Project Statement

<u>Project</u>	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>
Fruit Frost Service,.....	\$ 22,389	\$26,936 (a)	\$26,936
Harvest Weather Service,	8,051	11,664	11,664
Fruit-Spray Service,	1,325	1,800	1,800
Totals.....	\$31,765	\$40,400	\$40,400

(a) Includes \$7,000 of an item of \$7,500 provided for 1929-1930 by Second Deficiency Act, 1929.

WEATHER BUREAU (Continued)Activities under this AppropriationGeneral

By means of expressly trained personnel, intensive, specialized work is conducted in the field under this appropriation for the protection and benefit of horticultural crops. The work at present is confined principally to the States of Washington, Oregon, California, Alabama, Florida, and New York.

Fruit Frost Service: Several specialists in frost protection are assigned to cooperate with fruit growers in different sections of the country in protecting their orchards from frost. Their work consists of making temperature surveys to determine the relative susceptibility of different localities to frost, the issuing of forecasts and warnings, experimental work to determine the most effective and economical methods of protection, and the giving of advice to growers and prospective growers as to favorable locations for orchards and as to heating requirements to prevent frost damage. The specialists study the thermal relations of different localities of their districts and make each day, during the danger period, a very definite forecast of the lowest temperature expected during the ensuing night. The orchardists in the respective districts are notified through a specially arranged system of communication. This service has heretofore been conducted principally in the far West; it is being inaugurated this year in the East Gulf Section.

Harvest Weather Service: This project is conducted for the benefit of farmers in the harvesting of hay, wheat, and other crops. The work is carried on in an intensive way in New York State and to a less degree in Indiana, Michigan, New Jersey, Ohio, Oregon, Pennsylvania, and Wisconsin.. Forecasts are issued for guidance in harvesting of crops liable to damage or loss if unfavorable weather occurs between the time of cutting and shocking. The predictions are for as long a period as the forecaster feels that the conditions as shown by the current weather map justify a reasonable expectation of accuracy, and are worded to apply to the particular purpose of harvesting and to convey to the farmer the degree of confidence that the forecaster has in his forecasts. This work is conducted in cooperation with State Extension and County Farm Bureau Agents who disseminate the forecasts by telephone to the individual farmers.

Fruit-Spray Service: A special fruit-spraying service is operated in several of the important fruit-growing districts. It consists in the issuing of special weather forecasts as a guide in the application of sprays to trees. The efficiency of sprays, both as insecticide and fungicide, is largely determined by their being applied under proper weather conditions. Therefore it is important that the orchardists have correct information as to coming weather conditions. The forecasts are made for just as long a period in advance as conditions shown on the weather map warrant. The project is intensively organized and conducted in New York State and to a lesser degree in Indiana, Michigan, New Jersey, Ohio, Oregon, Pennsylvania, and Wisconsin.

WEATHER BUREAU (Continued)(d) AEROCLOGY

Appropriation, 1930:

Facial,	\$ 500,000
Deduct \$50,000 made immediately available in the	
1930 Appropriation Act,	50,000
Subtotal,	450,000
Add available balance for 1930 provided by the Second	
Deficiency Act, 1929,	350,000
Total Available, 1930,	800,000
Budget, 1931,	1,400,000
Actual increase,	600,000
(Apparent increase,	900,000)

An increase of \$600,000 is submitted for the extension of the commercial airways service.

The purpose of this estimate is to make possible the extension of intensive service for flying operations on commercial airways under the provisions of the Air Commerce Act approved May 20, 1926 (U.S.C. p. 1929, Sec. 313) which assigns to the Weather Bureau the duty of furnishing such weather reports, forecasts and other meteorological information as may be required to promote the safety and efficiency of air navigation in the United States and above the high seas, particularly upon commercial airways designated as such by the Secretary of Commerce, and for such purposes to establish meteorological offices and stations and prosecute such other activities as necessary to observe, measure, and investigate atmospheric phenomena. On July 1, 1930, there will be approximately 15,500 miles of airways equipped with beacon lights for night flying. On these routes about 3,000 miles are adequately served and about 5,000 miles are partially served at the present time. This partial service over 5,000 miles consists largely of day-time reports and it will be necessary to also provide night-time reports as well as to organize 24-hour service for the remaining approximately 7,500 miles of airways. Provision is also made in this item for a limited service in the Alaskan and Hawaiian territories where aeronautical activities are developing rapidly. The proposed service in all cases includes frequent regular reports on the airways and less frequent but regular reports from selected points at some distance from the airways. The reports and short period forecasts based thereon are distributed by telegraph and telephone to landing fields and broadcast by radio stations of the Department of Commerce for the benefit of pilots in the air. Experience of the past shows that this service is essential to the safety and efficiency of airways operations.

Details of the extension contemplated under this increase of \$600,000 are as follows:

(1) Providing service on new airways and additional service (at night) on existing airways, \$301,125.

This item will permit the organization and operation of pilot balloon

WEATHER BUREAU (Continued)

work at five selected points on the airways; provide additional night reports for seventy-five ground stations on 4,937 miles of existing airways, and similar service at one hundred twenty-five ground stations on new airways, both day and night, requiring the employment of two observers at each station.

Proposed expenditures are classified as follows:

Salaries.....	\$ 42,200
Wages,	97,500
Scientific equipment,	29,400
Other equipment,	3,000
Telegraphing and telephoning,	120,525
Travel,	2,900
Miscellaneous supplies and services, .	5,600
Total,	\$301,125

(2) Extending the three-hourly reporting system to the San Francisco-Seattle, the Chicago-Brownsville, and a six-hourly system on the Boston-Jacksonville airways, \$194,660.

Extension of the three-hourly reporting system will be accomplished by the organization of five major control stations at Portland, Oreg., Kansas City, Mo., Dallas or Fort Worth, Tex., Atlanta, Ga., and Jacksonville, Fla. To these control stations, three-hourly or six-hourly reports as the case may require, will be sent from thirty-six selected stations, requiring fifty-six observers.

The proposed expenditures are classified as follows:

Salaries,	\$135,580
Telegraphing and telephoning,	50,280
Travel,	4,000
Equipment,	3,000
Miscellaneous supplies and services,	1,800
Total,	194,660

(3) Organization of service over the Southwestern sections of the United States, extending from Kansas City, Fort Worth and Dallas westward to Los Angeles, \$25,300.

This greatly needed service will be provided by the establishment of two new first order airways stations in the Southwest contiguous to airway routes.

Expenditure classification of the item is as follows:

Salaries,	\$15,680
Scientific equipment,	4,080
Scientific supplies,	1,540
Rental,	1,800
Travel,	600
Miscellaneous supplies and services,	1,600
Total.....	\$25,300

WEATHER BUREAU (Continued)

(4) Adding reports of ceiling and visibility to twice-daily reports from three-fourths of the regular Weather Bureau stations, \$30,000.

This important information will be secured by the addition of one word to the regular telegraph reports sent from a majority of the Bureau's regular stations. The cost is entirely for telegraph tolls.

(5) Organizing a limited service in Alaska, \$29,795.

This item provides for the establishment of two first order airways stations and of reporting stations from fifteen selected points on the airways.

The principal expenditures will be as follows:

Salaries,	\$ 11,260
Wages,	8,500
Scientific equipment,	5,070
Other equipment,	1,000
Scientific supplies,	1,500
Travel,	1,200
Miscellaneous supplies and services,	1,265
Total,	\$ 29,795

(6) Organization of a limited service in Hawaii, T. H., \$5,300.

This item will provide for a very limited amount of airways service covering the inter-island routes in the Territory of Hawaii, to consist principally of pilot balloon observations.

The proposed expenditures are classified as follows:

Salaries.....	\$ 3,240
Scientific equipment and supplies, .	1,760
Travel,	300
Total.....	\$ 5,300

(7) Project supervision at Washington, D. C., and operation of major control station at Bolling Field, D. C., \$13,820.

This item provides for the employment of five meteorologists and observers at Washington, D. C., for supervisory work and research in connection with the foregoing items, (1) to (6), and for the operation of the major control station at Bolling Field, D. C.

WEATHER BUREAU (Continued)Project Statement

<u>Project</u>	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>	<u>Increase</u>
Aerological Observations and Reports,	\$ 71,830	\$ 72,300	\$ 72,300	- -
Aviation Forecasts and Warnings,	19,157	19,300	19,300	- -
Commercial Airways Service,	252,126	671,400	(a) 1,271,400	\$600,000
Aerological Survey of the United States,	<u>36,779</u>	<u>37,000</u>	<u>37,000</u>	<u>- -</u>
Totals.....	\$379,829	\$800,000	\$1,400,000	\$600,000

(a) Includes \$350,000 provided by Second Deficiency Act of 1929, but excludes an item of \$50,000 provided in the 1930 Appropriation Act, Department of Agriculture, but made "immediately available" during 1929.

Activities under this AppropriationGeneral

Investigation and study of the upper air and general weather forecasting in the interest of air navigation are conducted under this appropriation. As a consequence of the Air Commerce Act of 1926, meteorological information and flying weather forecasts are being furnished to pilots on all airways designated as routes suitable for air commerce by the Secretary of Commerce.

Aerological Observations and Reports: Observations of upper air conditions are made by means of kites, pilot balloons and sounding balloons. Daily kite flights are conducted, as regularly as practicable, at five special stations located in Indiana, North Dakota, Oklahoma, Texas, and South Carolina. On the average these kites reach a height of 3 kilometers (2 miles) and carry small self-recording instruments showing atmospheric pressure, temperature, humidity, and wind velocity and direction at all heights reached. Pilot balloons, six inches in diameter and inflated with hydrogen to twenty-eight inches in diameter, are released at numerous substations and observed by means of a theodolite, or modified form of transit.

WEATHER BUREAU (Continued)

The balloons ascend at a constant known rate and the readings secured by the theodolite observer in azimuth and elevation circles permit of determination of wind direction and velocity at various heights. Sounding balloons are similar but larger than pilot balloons and carry light instruments. They ascend to heights not otherwise reached, in a few cases exceeding 30 kilometers (18 miles).

Aviation Forecasts and Warnings: Under this project simultaneous observations of the upper air are taken and transmitted by telegraph to district forecast centers located in Washington, D. C., Chicago, Ill., New Orleans, La., Denver, Colo., and San Francisco, Calif., where they are entered by chartmen on eight outline maps of the country, representing various heights, including surface and 250, 500, 1,000, 1,500, 2,000, 3,000, and 4,000 meters. These charts, in conjunction with other synoptic weather maps, enable qualified forecasters to issue what are designated as "flying weather forecasts" for certain zones and routes and serve as important aids to Government and general air navigation operations.

Commercial Airways Service: The Air Commerce Act of 1926 designates the Weather Bureau to furnish, upon recommendations from the Secretary of Commerce, such meteorological service as is required for safe and efficient flying operations on commercial airways designated as such by the Department of Commerce. To carry out the provisions of this Act, there is being established a complete net-work of stations along and on each side of the designated airways by means of which frequent observations of meteorological conditions, both surface and upper air, may be taken and forwarded to certain selected key, or control, stations where the information is tabulated and charted to form the basis of advices and forecasts issued for the aid and protection of the pilots.

Aerological Survey of the United States: This activity embraces the classification and summarization of aerological data for use in a variety of investigational studies including (1) a country-wide statistical compilation, giving in tables, graphs, and text the essential elements regarding upper air conditions in the United States; (2) investigations of the upper air conditions in cyclones and anticyclones to develop relationships between upper air conditions and the formation, movement, and other characteristics of these phenomena; and (3) determination of diurnal variation of meteorological elements at various heights.

Change in Language

The language of this item has been amended by eliminating the following phrase: "of which amount \$50,000 shall be immediately available".

BUREAU OF ANIMAL INDUSTRY

(Changes in Language at End of this Bureau)

(a) GENERAL ADMINISTRATIVE EXPENSES

Appropriation, 1930..... \$182,900
 Budget, 1931..... 182,900

Project Statement

<u>Project</u>	<u>Expended</u> <u>1929</u>	<u>Estimated,</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>
General Administration.....	\$172,037	\$182,900	\$182,900

Activities under this Appropriation

General

This appropriation is used for the payment of overhead expenses of the bureau, which are difficult to allocate to individual divisions or projects, as the expenses of the chief's office, including audits, accounts, appointments, library, and editorial work.

(b) INSPECTION AND QUARANTINE

Appropriation, 1930:

Facial.....	\$768,600
1928 unexpended balance reappropriated for 1930.....	15,000
Total available, 1930.....	783,600
Budget, 1931.....	795,000
Actual increase.....	11,400
(Apparent increase.....)	26,400)

The increase of \$11,400 is submitted for the following purposes:

(1) \$11,400 for a closer supervision over the importation of animal by-products, feeding materials, etc. from countries infected with foot-and-mouth disease or rinderpest. The added funds will render possible the assignment of three additional full-time inspectors at important ports of entry and enable not less than thirteen part-time men at other ports to devote more attention to the enforcement of regulations prohibiting the landing and feeding of garbage obtained from vessels provisioned with meats in infected countries and allow closer

BUREAU OF ANIMAL INDUSTRY (Continued)

supervision over the landing, shipment, general sanitary control, and disposal of import hides, other animal by-products, feeding materials, etc.

Project Statement

<u>Project</u>	<u>Expended,</u> <u>1929</u>	<u>Estimated,</u> <u>1930</u>	<u>Estimated,</u> <u>1931</u>	<u>Increase</u>
Eradication of scabies in sheep.....	\$138,703	\$149,720	\$149,720	—
Eradication of scabies in cattle and horses.....	127,640	131,330	131,330	—
Control over the interstate shipment of live-stock.....	287,422	281,045	281,045	—
Enforcement of the 28-hour law.....	31,160	34,160	34,160	---
Inspection and mallein testing of horses for interstate shipment.....	1,253	7,450	7,450	---
Quarantine of animals at ports of entry.....	24,820	25,425	25,425	----
Inspection of animals for import.....	76,601	79,545	79,545	—
Control over the importation of animal by-products, feeding materials, etc.....	66,853	66,850	78,250	\$11,400 (1)
Inspection and testing of animals for export.....	2,334	4,180	4,180	—
Inspection of vessels carrying export animals..	1,903	3,895	3,895	
Total	<u>758,689</u>	<u>783,600</u>	<u>795,000</u>	<u>11,400</u>

Activities under this AppropriationGeneral

The work under this appropriation consists of the eradication of scabies in sheep and cattle, the inspection of southern cattle, the

BUREAU OF ANIMAL INDUSTRY (Continued)

control of the interstate transportation of livestock, the inspection of vessels, the enforcement of the 28-hour law, the inspection and quarantine of imported animals, including the establishment and maintenance of quarantine stations, and repairs, alterations, improvements, or additions to buildings thereon, the supervision over the sanitary handling of hides, skins, wool and other animal by-products, feeding materials, and fertilizers offered for importation into the United States, the investigational and inspection work relative to the existence of contagious diseases, and the inspection and mallein testing of animals.

Eradication of scabies in sheep: In this work employees are detailed to cooperate with State officials in inspecting all sheep in infected areas and in supervising the dipping of all affected and exposed bands. Where the disease exists on Indian reservations the work is carried on in cooperation with the Office of Indian Affairs. Prosecution of this work will be essential in order to prevent the dissemination of the disease to free areas of the United States. In view of the increasing goat industry in certain sections of the southwest and the development of scabies in these animals, more or less work of inspection and supervised dipping of goats will probably be necessary during the next year in connection with sheep scabies eradication.

Eradication of scabies in cattle and horses: As in the case of sheep scabies, State livestock sanitary officials and owners in affected States are assisted in measures of control and eradication through the inspection and dipping of infected and exposed animals. During the past fiscal year there were over three and one-half million cattle inspected, of which number nearly one hundred thousand were found infected. The percentage of infection was 34 per cent less than for the preceding year. Horse scabies appear to be confined in large measure to Indian reservations. It seems essential that we be prepared to aid the Office of Indian Affairs in dealing with any outbreaks as occasion arises.

Control over the interstate shipment of livestock: Under this project is conducted the inspection service at public stockyards, of which there are 49, in 47 cities. All livestock received are inspected for communicable diseases and animals found to be affected or exposed are given appropriate treatment or otherwise disposed of in such a way as to prevent the spread of diseases to thountry points. This service is of value to the producer (1) by affording a means of tracing diseased shipments to origin, thus enabling the local livestock sanitary officers promptly to apply appropriate measures, and (2) by preventing the further movement of diseased and exposed animals which, if it were not prohibited, would disseminate disease to non-infected premises and herds. In 1929, 18,665,970 cattle, 24,296,456 sheep, and 41,625,123 swine were inspected. An important activity under this project is the cleaning and disinfection of cars, of which 39,878 were so treated during the year. Transportation and stockyard companies cleaned and

BUREAU OF ANIMAL INDUSTRY (Continued)

disinfected railroad stockyards regularly used in the feeding, watering, and resting of livestock and also those sections of public stockyards in which feeder cattle were handled. This was done in an effort to minimize losses from hemorrhagic septicemia.

Enforcement of the 28-hour law: The work under this project consists in the detection of violations of the law to prevent cruelty to animals in transit. Railroads on the whole are doing their utmost to observe the requirements of this law and the situation during the past fiscal year was very satisfactory. Penalties amounting to \$27,750 for violations of the law were collected.

Inspection and mallein testing of horses for interstate shipment: This activity is largely conducted at public stockyards, the service being performed by employees engaged on work in connection with the control of the interstate transportation of livestock. During the year 8,881 horses and mules were inspected and 3,232 were tested.

Quarantine of animals at ports of entry: In order to fully establish freedom from disease, import animals of certain kinds are held in quarantine at time of entry at our coast and border ports. Quarantine stations are maintained by the Department at Boston, New York, and Baltimore. It will be essential to maintain them in good condition and available in order to meet provisions of the law and regulations. During the past fiscal year 2,816 animals were subjected to quarantine at time of entry.

Inspection of animals for import: The inspection of all import horses, cattle, other ruminants, and swine is required by act of Congress. Careful inspections at coast and border ports are essential to safeguard our domestic livestock industry from the menace of diseases of foreign origin. During recent years an average of over 600,000 animals has been inspected before importation.

Control over the importation of animal by-products, feeding materials, etc.: Inspectors at ports of entry supervise the sanitary handling and control of import hides, skins, hair, wool, gluestock, fertilizer of certain kinds, manure, previously used bagging, feeding materials, etc. In order to guard against the introduction of foot-and-mouth disease and rinderpest, shipments not properly certified in the country of origin are shipped in sealed cars to tanneries or other establishments for disinfection in process of manufacture or are otherwise controlled. Measures are taken to guard against the landing and feeding of garbage from ocean vessels provisioned with meat originating in regions in which either foot-and-mouth disease or rinderpest exists; also a check is kept upon importations of dressed poultry from any infected region to assure removal and destruction of the feet.

BUREAU OF ANIMAL INDUSTRY (Continued)

Inspection and testing of animals for export: Livestock for export are inspected and in certain instances tested and, when found free from disease, certified as provided under specific regulations of this Department and as required by receiving countries. During the past year 16,510 animals of this kind were inspected prior to shipment.

Inspection of vessels carrying export animals: Transporting vessels are inspected in order that they may be fitted to conform with requirements of the law and regulations for the safe and humane handling of animals. Ordinarily between two hundred and three hundred vessels of this kind are inspected annually.

(c) ERADICATING TUBERCULOSIS

Appropriations, 1930:

Facial.....	\$6,061,000
1928 unexpended balance reappropriated	
for 1930.....	300,000
Total available, 1930.....	6,361,000

Budget, 1931:

Facial.....	5,540,000
1929 unexpended balance reappropriated	
for 1931.....	650,000
Total estimated, 1931.....	6,190,000

Actual decrease.....	171,000
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(Apparent decrease.....)	521,000)
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(1) \$171,000 decrease in the funds allotted for indemnities for tubercular animals. Due to the progress made in tuberculosis eradication, a large sum of the amount appropriated for this work in 1929 was unexpended. If similar conditions prevail in 1931, it is thought that the appropriation may be reduced as indicated.

Project Statement

<u>Project</u>	<u>Expended,</u> <u>1929</u>	<u>Estimated,</u> <u>1930</u>	<u>Estimated,</u> <u>1931</u>	<u>Decrease</u>
Tuberculin testing of cattle at public stockyards.....	\$56,740	\$65,720	\$65,720	---
Eradication of tuberculosis from herds of cattle and from circumscribed areas.....	1,085,030	1,092,880	1,092,880	---
Indemnities for animals slaughtered on account of tuberculosis.....	3,946,130	5,171,000	5,000,000	\$171,000 (1)
Animal tuberculosis investigations.....	25,385	31,400	31,400	---
Total.....	5,113,285	6,361,000	6,190,000	171,000

BUREAU OF ANIMAL INDUSTRY (Continued)

Activities under this Appropriation

General

The object of this work is to assist in a campaign to control and eradicate tuberculosis among livestock under a uniform plan in cooperation with the States. This campaign was launched as a Federal aid project after an extensive survey showed the disease was spreading. The states and livestock owners have looked to the federal Government for leadership in this work since its inauguration, and desire that this assistance be continued, as many failures occurred when independent efforts were employed. Approximately \$13,500,000 was appropriated last year by the various States to assist in this campaign. The appropriation has been divided to provide for operating expenses to supervise the work, and indemnity for animals slaughtered because of being affected with tuberculosis.

Tuberculin testing of cattle at public stockyards: Breeding and dairy cattle offered for interstate shipment from public stockyards are required to be accompanied by a chart showing that they have passed a satisfactory tuberculin test. Bureau veterinarians apply the tests to such animals and certify them for interstate shipment. This activity also includes supervision over the disposition of reactors to the tuberculin test, which are shipped in large numbers in accordance with Federal and State laws to public stockyards to be disposed of for immediate slaughter.

Eradication of tuberculosis from herds of cattle and from circumscribed areas: The amount of money appropriated for operating expenses is used to employ veterinarians who are assigned to administering the tuberculin test to individual herds of cattle under a uniform system known as the accredited herd plan; also, to participate in administering the tuberculin test to all cattle in a prescribed area under a national program known as the area plan. Veterinarians are also assigned to supervise the work of other cooperating agencies. Traveling expenses of veterinarians, maintenance of field offices, and miscellaneous administrative expenses are also charged against the operating expenses. There are at present 176,393 fully accredited herds of cattle in the United States, and 806 counties are qualified as modified accredited areas. Two entire States are now modified accredited areas.

Indemnities for animals slaughtered on account of tuberculosis: This fund is used to reimburse livestock owners in part for losses sustained because of having their cattle slaughtered on account of being affected with tuberculosis. Excellent progress has been made in eradicating tuberculosis in livestock because of the assistance rendered to farmers under this fund. During the fiscal year 1929 Federal indemnity was paid on 51,682 claims, covering 140,656 tuberculous animals.

BUREAU OF ANIMAL INDUSTRY (Continued)

Animal tuberculosis investigations: Investigation of this disease has long received attention and important facts as to its nature, mode of transmission, and its relation to human health have been discovered, as: Cattle do not contract tuberculosis from man; the principal channel through which tuberculous cattle discharge infection is their bowels; the feces of such cattle are the principal source of progressive tuberculosis in hogs. The discovery of these facts has helped to make the control and eradication of the disease possible and to protect human health. At present tests of the Calmette method of vaccination are being made, results of which thus far obtained indicate that though the treatment is probably harmless it does not protect cattle from becoming infected with tuberculosis when they are exposed to it and that it can not in any way supplant the effective eradication method now used. Studies are also being made in connection with so-called skin tuberculosis and no-lesion reacting animals and also to determine whether tubercle bacilli which affect cattle may be changed appreciably in their infectivity for other animals by long sojourn in them. Tests of commercial tuberculin for purity are made from time to time.

(d) ERADICATING CATTLE TICKS

Appropriation, 1930.....	\$736,000
Budget, 1931.....	770,000
Actual increase.....	34,000

The increase of \$34,000 is submitted for the following purpose:

(1) \$34,000 to extend the work of eradication in Texas. For the past four years, under the provisions of the Texas tick-eradication law, a block of about 32 east Texas counties was not required to make any effort to eradicate the cattle tick unless by an election the people chose to request the Live Stock Sanitary Commission to undertake the work in their counties. The result has been that in this large area, comprising more than one-half of the inactive quarantined territory remaining in the State, no systematic effort at tick eradication has been undertaken. A bill passed in May, 1929, by the Texas Legislature, has changed this by placing all tick-infested area on an equal basis in the State, as to designation for eradication work whenever considered advisable by the Texas Live Stock Sanitary Commission. It is expected that this action will result in a large increase in the Texas territory that will be worked during the next two years, and that it will therefore be in the best interests of the project, and will hasten the completion of the work, if the Bureau has funds available with which to conduct its part in the resulting enlarged program.

Project Statement

<u>Project</u>	<u>Expended,</u> <u>1929</u>	<u>Estimated,</u> <u>1930</u>	<u>Estimated,</u> <u>1931</u>	<u>Increase</u>
Eradication of cattle ticks.....	\$707,646	\$736,000	\$770,000	\$34,000 (1)

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BUREAU OF ANIMAL INDUSTRY (Continued)

Activities under this Appropriation

General

This appropriation is used cooperatively for the payment of salaries and travel, and office expenses, of veterinarians and agents in Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, and Texas, in the eradication of the southern cattle tick, which spreads splenic fever infection among cattle. As counties are cleaned up they are released from Federal quarantine, and their surplus livestock may then be shipped to markets without restrictions. The States generally are contributing larger sums to this work than the appropriation provided by the Federal Government. The work is done under State laws and regulations, Federal money being expended for supervision, thus insuring that all measures of eradication be so carried out as to warrant the release of cleaned areas from quarantine.

(e) ANIMAL HUSBANDRY INVESTIGATIONS

Appropriation, 1930:

Facial	\$520,790
*Balance available 1930 for special barley investigations, Second Deficiency Act, 1929	8,947
*That part of the unexpended balance of \$10,000,000 appropriated by joint resolution February 23, 1927, reappropriated and assigned to the Bureau of Animal Industry for use in 1930 in special corn borer research	10,000
Total available, 1930	539,737
Budget, 1931	660,000
Actual increase	120,263
(Apparent increase	139,210)

* These two items, formerly appearing as Miscellaneous Items, are merged with Animal Husbandry Investigations in 1931.

The increase of \$120,263 is submitted for the following purposes:

(1) \$8,000 for swine investigations. Two items are contemplated: (a) \$6,000 for studies of types of hogs. Packers say that, because of public demand, a change in the type of hogs generally produced is needed. Type can be classed in three groups, large, medium, and small. The farmer is interested in knowing which of the three types he can use to produce what the packer wants. The proposed study would include feed cost of herd sows and boars of the three groups, prolificacy of sows, per cent of pigs weaned, cost of gain of pigs in the feed lot, dressing yields, firmness of the carcasses, and the relative quality of pork produced. (b) \$2,000 for inbreeding experiments. This additional amount is needed for feed to carry additional animals in order to arrive at conclusions more quickly and economically than can be done with the number of breeding animals now in use.

BUREAU OF ANIMAL INDUSTRY (Continued)

(2) \$8,000 for sheep and goat investigations. It is proposed to spend: (a) \$5,000 for labor and feed at the U. S. Sheep Experiment Station, Dubois, Idaho. Range sheep investigations at this station must be conducted on a scale typical of the operations of range sheep producers in order to have that station render full services. Extreme difficulties have been encountered in attempting to accomplish the experimental work of the station in a satisfactory manner because of the serious lack of funds herein recommended for competent labor and sufficient feed for wintering the sheep. Without the amount of increase recommended, the station will be so handicapped as to make it impossible to progress efficiently; (b) \$3,000 for supplies and additional technical service for Angora goat and goats' milk investigations. This work has progressed to a point where more funds are necessary to take full advantage of what has been accomplished. This project involves the solution of the nutritional, chemical, bacteriological, physiological, and other properties of goats' milk. Without this support, progress already made and opportunities for taking advantage of this progress will be handicapped. This increase would provide for a small flock of Angora goats to furnish information urgently needed for the benefit of the Angora goat and mohair industry.

(3) \$5,000 for horse and mule investigations. The \$5,000 would be used as follows: (a) \$5,000 for laboratory equipment and supplies at the U. S. Morgan Horse Farm, Middlebury, Vermont, for a study of the factors affecting the growth of colts and other animals. The proper development of horses means the difference between profit and loss to the breeder. Yearling colts have sold as high as \$34,000, yet the average valuation of all horses on farms is \$69.95. This spread in values is due to some determining cause, such as breeding, weight for age, quality, etc. Research studies to determine these factors are highly important to this vast livestock enterprise involving an investment of nearly $1\frac{1}{2}$ billions of dollars. It is proposed to make a thorough study of the requirements for growth in colts and other young animals which will include supplemental feeding and irradiation.

(4) A decrease of \$10,000 on account of the non-recurring item of repairs, etc., at the U. S. Animal Husbandry Experiment Farm, Beltsville, Maryland; offset by an estimate of \$10,000, increase for farm operations including clearing, draining, and fencing of pasture and crop land in feed and forage production, repairs to bridges and roads to facilitate their use for experimental purposes.

(5) \$25,000 for beef and dual purpose cattle investigations. The increase will be used as follows: (a) \$10,000 to provide for labor, feed, forage, and equipment for studies with beef and dual purpose cattle at Beltsville. According to the 1925 census, 21 per cent of the cows milked in this country were beef cows. In the sections producing a surplus of corn and oats the census shows almost as many beef cows being milked as dairy cows. This situation indicates that farmers in such sections like to have beefy

BUREAU OF ANIMAL INDUSTRY (continued)

milking cows, and believe that they yield best returns considering the feed, labor, and market conditions under which operations are conducted. The project dealing with the inheritance of milking and beefing qualities in Shorthorns seeks to ascertain whether milk and beef production are antagonistic in the one and the same animal, and if they are not, to fix, by bringing together the best of the breed, these characteristics so uniformly in seed stock that they will breed true for such market qualities. Investigations are now being conducted at Beltsville, the results of which are applicable to all sections of the country. If increased funds are not available, it will be impractical to carry on the research work now under way; neither will the Bureau be in a position to take care of the natural increase in the herds. (b) \$10,000 for beef cattle investigations in the area where cattle ticks have been eradicated. Large areas in North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Arkansas, and Texas would be greatly benefitted by a study of methods to be employed in beef production in the areas as released from quarantine. Sufficient effort has been devoted to this work in the past to indicate that an appropriation is urgently needed. This work is to be conducted in cooperation with the States. (c) \$5,000 for painting and essential repairs to buildings, maintenance of fences, corrals, and water development in connection with range cattle investigations at the U. S. Range Livestock Experiment Station, Miles City, Montana. The buildings at this station are in urgent need of paint without which serious damage is being done. The roofs of buildings need essential repairs to prevent further deterioration.

(6) Increase of \$74,000 in the item of poultry investigations, as follows: (a) \$55,700 for feeding research including an experimental fattening and breeding house, fattening batteries, battery brooders, killing and plucking facilities, cold storage for the purpose of conducting research work on the preparation of poultry and eggs for the diet, increased storage facilities for feeds, additional personnel and labor in order to efficiently carry out the various lines of nutrition research work and for feed and other supplies. At present there are no facilities for conducting experimental fattening work. With proper facilities for such work a vast amount of very valuable information could be secured. The wood structure in which both commercial and experimental feeds are now being stored is wholly inadequate because it is too small and insanitary, and is too far away from practically all of the experimental feeding pens. Moreover, it is impossible to install any machinery in the existing wooden structure. Under existing conditions it is practically impossible to prepare the experimental feeding rations as they should be prepared in order that the various conditions of the nutritional work may be properly controlled. This is one of the most important lines of work in behalf of the future development of the poultry industry. (b) \$8,000 for turkey research at Miles City, Montana. Turkey research work was begun in 1929 with the limited appropriation of \$7,500. This amount of funds is too small to conduct turkey

BUREAU OF ANIMAL INDUSTRY (continued)

research work efficiently, particularly when it is realized that not only a properly qualified associate poultry husbandman, but also a qualified zoologist, whose salaries aggregate \$5,800, are necessary in order to conduct research work in turkey raising on the most efficient basis. The labor of one man, in addition, is necessary, leaving very little for equipment and for operating expenses. The increase of \$8,000 is urgently recommended in order to provide for maintenance, feed, and labor. It is proposed to construct very simple sheds and to provide different yarding arrangements so that experimental work can be undertaken. Additional brooding facilities are necessary and a room must be equipped for killing and plucking turkeys. (c) \$5,600 for poultry research at Glendale, Arizona. This increase is recommended for the purpose of purchasing additional land and increasing the housing facilities. At present the efficient operation and management of this plant is handicapped very materially because the plant consists of only ten acres. In order that the station may be of the greatest possible use to the entire Southwest, it is desirable to conduct certain lines of experimental feeding work on a slightly larger scale than has been possible up to the present time. (d) \$4,700 for hatchability research. This increase is recommended in order that sufficient supplies may be purchased and facilities provided for continuing hatchability research work on a proper and efficient basis.

The four items enumerated above represent the most urgent needs of the Department from the standpoint of increasing its usefulness for the poultry industry. The National Poultry, Butter and Egg Association, the Poultry Research Society of America, the United States Egg Society, and the National Poultry Council, as well as other organizations, have requested that the Government undertake much more extensive research work, particularly in respect to nutritional and hatchability problems. Work at the experiment farm at Beltsville has been carried on under great handicaps, and an experimental fattening house, as well as a feed house, are very urgently needed, together with machinery and facilities for the preparation of rations and the experimental fattening of chickens, which also should include a study of the effect of specific feeds on the quality of poultry meat. Many changes of commercial practices are taking place and there is a keen demand for more knowledge on the best methods of preparing poultry for market. In view of the rapid development of the commercial hatchery industry until there are now over 10,000 hatcheries in the United States with a hatching capacity of many millions of eggs, there is a keen demand for research work on hatchability in an effort to reduce the high embryo mortality. Additional appropriation for turkey research work at the Miles City station is very urgently needed in order that the whole turkey research project may be carried out in the most efficient manner. Turkey growers in all parts of the country have requested that information be obtained on the effect of rations on growth and fleshing properties as well as on the best method

BUREAU OF ANIMAL INDUSTRY (continued)

of preparing turkeys for market. Additional funds are necessary for the Glendale, Arizona, station for the purpose of increasing the housing facilities and purchasing additional land to enlarge the plant and make it more useful to the entire Southwestern section of the country.

(7) Increase of \$763 for meat investigations to be used for maintenance and labor in connection with the meats laboratory at Beltsville, including the enlarging and repairing of controlled-temperature rooms, as far as possible.

(8) Increase of \$10,000 for research investigations in corn borer control. This is an increase only by transfer of the same fund from under "Miscellaneous Items" for 1931.

Project Statement

<u>Project</u>	<u>Expended,</u> <u>1929</u>	<u>Estimated,</u> <u>1930</u>	<u>Estimated,</u> <u>1931</u>	<u>Increase</u> <u>or decrease</u>
Swine investigations.....	\$53,085	\$61,820	\$69,820	+ \$8,000(1)
Sheep and goat investigations.....	90,760	92,930	100,930	+ 8,000(2)
Horse and mule investigations.....	35,924	39,110	44,110	+ 5,000(3)
Genetic research.....	20,162	21,350	21,350	----
Beltsville farm.....	47,089	54,970	54,970	----(4)
Beef cattle investigations.....	99,878	80,720	105,720	+ 25,000(5)
Certification of pedigrees.....	5,112	6,340	6,340	----
Poultry investigations...	111,524	116,450	190,450	74,000(6)
Nutrition research.....	31,876	29,210	29,210	----
Meat investigations.....	50,959	17,890	18,653	+ 763(7)
Repairing water system, Ft. Keogh, Mont.....	29,027	---	---	---
Special barley investigations.....	9,937	8,948	8,447	- 500
Special corn borer research.....	9,812	10,000	10,000	----(8)
Total.....	595,145	539,737	660,000	+ 120,263

BUREAU OF ANIMAL INDUSTRY (continued)Activities under this AppropriationGeneral

The animal husbandry investigations of the Bureau of Animal Industry deal with livestock problems of regional and national importance having to do with the breeding, feeding and management of domestic farm animals including poultry. Results are measured in terms of quantity and quality of the animals or their products, such as meat, eggs, wool and mohair. These experiments often are conducted in cooperation with other bureaus and divisions of the Department, with one or a group of State agricultural experiment stations, with farmers and other agencies. Cooperative experiments are being conducted during the present fiscal year with a total of 35 States.

Swine investigations: Investigations of the causes of soft pork were continued in cooperation with a number of State experiment stations. Conclusions were reached and published regarding the use of soybeans, both raw and cooked, various rice by-products, cottonseed oil, and rations low in fat content but varying in protein content. Not only the type of ration but the length of the feeding period, the starting and finishing weights of the pigs, the rapidity and total amount of gain are all found to have an influence upon the firmness of the resulting pork.

Experiments in the production of Wiltshire sides for the English bacon trade were continued with two breeds of swine and two types of crossbreds developed from the two breeds. Eighty per cent of the carcasses of one group of 40 crossbreds succeeded in meeting the rigid specifications of this type of product.

A project aiming toward the development of more efficient types of swine through inbreeding is being continued, as is the study of the palatability of various samples of scabby barley, and the experiment to determine the effect on the teeth and bone structure of hogs of rations deficient in minerals. This latter project is being conducted in cooperation with the American Dental Association and Johns-Hopkins University.

Sheep and goat investigations: Under Corn Belt conditions in Indiana it was found that the net return per lamb was \$6.66 more for a flock of ewes and lambs kept on pasture only than for a similar flock fed alfalfa hay and grain in dry lot. This indicates very important advantages in good pasture for lamb production.

At Newell, S. D., the sheep-carrying capacity of irrigated pastures of both alfalfa and sweet clover averaged 16 times more per acre than excellent native range.

Flushing experiments at Beltsville, Md., showed that extra feed for ewes at breeding time resulted in 20 more lambs per 100 ewes, which agrees with previous results.

At Dubois, Idaho, ewes carried on dry sage-brush ranges were used in an experiment to determine the benefits from supplementing

BUREAU OF ANIMAL INDUSTRY (continued)

the range with cottonseed cake. Ewes fed from one to two-thirds of a pound of cake a day gained 3 pounds in two months and the ewes receiving no supplement lost 10 pounds during the same time.

In a Karakul sheep-breeding experiment at Beltsville, Md., a flock of purebred Karakul ewes and one of Blackfaced Highland ewes were bred to a purebred Karakul ram of special merit. The fleeces from the crossbred lambs from the Blackfaced Highland ewes averaged 70 per cent as good as those of the purebred Karakul lambs in pattern of curled fiber and 57 per cent as good in luster of fiber. This indicates that there may be an important opportunity in the growing of sheep for lambskin production through the use of Blackfaced Highland ewes as foundation stock and top crossing for several generations with purebred Karakul rams.

At College Station and Sonora, Texas, cooperative studies with Angora goats have revealed the possibility of eliminating kemp from mohair by selective breeding systems.

Studies in the growth of wool in cooperation with nine State experiment stations have revealed the facts that as wool grows longer in a given period of time the same fibers have a tendency toward greater diameter. This explains why it is so difficult to grow superfine wool with a satisfactory length of staple, and should form a basis for great savings to wool growers, since this finding indicates definitely the limitations in the production of long staple wool that is superfine.

Through the leadership of this section, 24 purchase specifications were prepared in cooperation with other members of a technical committee of the Federal Specifications Board.

Essential nutritional differences were found between goats' milk and cows' milk as well as promising leads toward the solution of the causes of these differences.

Horse and mule investigations: A project in feeding city work horses showed that horses receiving 8 pounds of hay per day maintained their weight, vigor, health, appearance, and ability to work as well as did groups of horses getting as high as 16 pounds per day.

Preliminary trials in feeding Army horses at Fort Myer, Va., indicate that variations from the standard ration of oats and hay may be used, and economies effected.

Breeding stock has been distributed from the U. S. Morgan Horse Farm, Middlebury, Vt., for the improvement of light horses in New England and other States, and Central America.

A survey of the farm power problem has been inaugurated in cooperation with other bureaus of the Department and ten cooperating States in the Corn Belt and Cotton Belt.

Genetic research: One line of guinea pigs reached the 29th generation of inbreeding. We are nearing the development of strains of guinea pigs homozygous for eight factors.

A study of the effect of age at first breeding on fertility was carried on and the results showed that guinea pigs which were not bred until 500 days of age had fewer young which were smaller and less viable than those from dams bred at 33 days of age.

BUREAU OF ANIMAL INDUSTRY (continued)

A study of the muscle tissue of the five families of inbred guinea pigs brought to light differences which promise to be of value in our study of the factors affecting the quality of meat in larger animals.

An X-ray laboratory was constructed and partly equipped.

Beltsville farm: Recognizing the need of a nearby proving ground for conducting experiments in animal husbandry, the United States Department of Agriculture purchased, in 1910, a 500-acre tract near Beltsville, Prince Georges County, Md., and divided it into two experiment farms, one for dairy cattle, the other for beef cattle, horses, sheep, goats, swine, and poultry.

The latter farm was augmented in 1926 by an additional purchase and now includes more than 1,300 acres, which are being devoted to scientific and practical research in animal husbandry.

Its specialized equipment, its trained personnel, and its uniform animals of known ancestry, all centralized near the headquarters of officers in charge, make it an invaluable factor in the Government's search for more efficient methods of livestock production.

Beef cattle investigations: A three-year project was completed showing conclusively that it pays to feed grain to steers being fattened on grass in the eastern part of the United States. Profits were increased 22 per cent over fattening on grass alone.

A reconnaissance of beef production in the Appalachian region indicates that rough pasture land should be used for raising cattle and carrying stockers rather than for attempting to fatten steers.

Six years' record shows conclusively that cattle make better gains on burned pastures than they do on unburned pastures in the cut-over region along the Gulf Coast but the experiment is incomplete on account of lack of funds, because data have not been collected to show the effects of burning upon the rate of erosion, soil fertility and character of the pasture plants.

Analyses of three years' records on ranch operation in the northern Great Plains indicate that failure to supply sufficient winter feed, contagious abortion, failure to feed the bulls well and poor management of available grazing land are some of the chief reasons for failure to make a profit in range cattle production.

A survey of ranches in the Edwards Plateau of Texas indicate that cattle, sheep and goats can use the same range to advantage. When the range is overstocked the cattle show the effects of it first.

Certification of pedigrees: Under the provisions of Paragraph 1506 of the Tariff Act of 1922 the Bureau issued certificates of pure breeding for 392 horses, 6,824 cattle, 3,014 sheep, 8 swine, 1,444 dogs and 10 cats during the fiscal year ending June 30, 1929.

Poultry investigations: It was determined that 18 per cent protein from meat scrap or skim milk is more efficient in laying rations than lower percentages and just as efficient as higher percentages even up to 25 per cent. Meat scrap as a source of animal protein in laying rations is more economical than dry skim milk. It was determined that growing

chicks also required about 18 per cent protein in their rations.

Sulphur compounds were found to be of some value in promoting the molt and in increasing egg production.

Cod-liver oil in the proportion of 2 per cent of the ration for growing chicks prevents leg weakness from developing.

Disposing of breeders that are affected with bacillary white diarrhea leads to a decrease in the mortality of chicks hatched from these birds.

It was found that earliness of maturity is highly correlated with annual egg production.

Valuable data were secured in a comprehensive project on incubation. Sixty per cent relative humidity is the optimum humidity in incubation.

Vitamin requirements for both growing chicks and laying hens are being studied, using mercury vapor and carbon arc lamps. The vitamin problem is an important one because the various vitamins have such a potent effect on growth, reproduction, and egg production.

Digestion trials are being continued to determine the coefficients of digestion of a number of poultry feeds.

A special project deals with the proper balance between calcium and phosphorus in the rations for growing chicks. This has been found to be particularly important because if there is not a proper balance growth is not at its best.

Nutrition research: Analyses were made of various products, including 495 samples of beef, 464 samples of pork, 229 samples of poultry, 244 samples of feed, and 1,284 miscellaneous analyses. Color determinations of meat were made on approximately 1,300 samples. In addition to supplying information with regard to the quality of meat these data have furnished a verification for the color chart for adult beef, but indicate that it has its limitations with regard to young beef. Information has been collected toward the preparation of color charts for young beef, cooked beef, and lamb.

A procedure has been developed for the extraction of proteins from fresh muscle which will remove from 80 to 86 per cent of the protein. This procedure will enable the comparison of different samples of meat provided they can be obtained immediately after slaughter.

The refractive index was determined on the fat from approximately 1,200 hogs. These data serve as the laboratory basis for the determination of the effect of feed on the hardness and softness of fat.

A study was made of the relation of animal products or their constituents to the regeneration of blood, in cooperation with the University of Rochester Medical School.

Meat investigations: Three-year old steers on blue grass pasture produced an equal amount of lean meat, that was as palatable as that from steers fed grain on grass. The supplement-fed cattle were fatter and dressed a higher percentage of carcass than the ones fed grass alone.

Grain-fed scrub calves fed by the Mississippi and Jonesboro stations produced roasts that were equally as tender and almost as full-flavored as those from purebred beef calves. Apparently plain cattle at 10 to 14 months of age are capable of producing acceptable market beef.

Heifer beef proved to be as palatable as steer beef. The heifers tended to fatten more rapidly than steers and were more wasteful when fed 200 days. The steers after 200 days of feeding were about as fat as were the heifers at 150 days.

The dark red color that appears in some beef carcasses has shown no relationship to the tenderness and palatability of the meat, other qualities being similar. This is in contrast to the general belief and practice of the beef trade.

Southdown, Shropshire, Hampshire and Cheviot crosses upon native West Virginia ewes produced no significant difference in the quality of the meat.

Lambs and ewes fed on grass alone in Indiana produced lambs and meat of a weight, fatness and palatability equal to that of lambs that were fed grain.

A mechanical method for measuring the breaking strength or tenderness of meat was devised and standardized and adopted by the cooperating State stations. The same thing is true of many of the other methods such as grading of animals and carcasses, preparation of samples, comparisons of color, physical analyses, cooking methods and grading of cooked meat.

With the special appropriation effective July 1, 1928, a new room was constructed and equipped for dressing the experiment animals and preparing the meat samples. An incinerator was selected of such type and capacity that it will serve the entire farm. An oversize boiler was put in that now makes it possible to heat a green house for the Bureau of Plant Industry, without duplicated expense to the Government.

Special barley investigations: A project has been begun to determine causes of unpalatability and vomiting existing in scab infected barley when used as a feed for hogs; to determine the nutritive value of scab infected barley and barleys of varied weights as compared with standard No. 2 grade yellow corn when fed to yearling beef steers and heifers, lambs, feeder pigs and laying hens; and to determine the digestibility of scab infected barley and barleys of varied weights on laboratory animals and selected classes of livestock.

Corn Borer Research: In studies of adjustments in livestock production practices made necessary by the advent of the European corn borer the husker-shredder and the utilization of shredded stover in livestock production have been investigated.

Land has been selected, plowed, and is now being seeded for a study of the greater use of pasture crops in livestock production in anticipation of a reduction of the corn crop.

(f) INVESTIGATIONS IN DISEASES OF ANIMALS

Appropriation, 1930:

Facial	\$353,780
Balance available, 1930, for special barley investigations, provided by Second Deficiency Act, 1929	3,000
Total available, 1930	356,780
Budget, 1931	410,000
Actual increase	53,220
(Apparent increase	56,220)

The increase of \$53,220 is submitted for the following purposes:

(1) \$10,220 for investigation of swine parasites. Studies will be made with regard to nodular worms which have been found to produce intestinal ulcers. Thorny headed worms which produce marked intestinal lesions and also intestinal perforations, and lung worms which are especially prevalent in the South and produce pneumonia will be given special attention. It is also proposed to initiate investigations on control measures for kidney worms which are among the most injurious parasites of swine and are the greatest handicap to the swine industry of the South. The cause for condemnations of livers, and other edible portions of swine, for parasitic infestations, amounting to millions of dollars annually, will be studied. Further investigations on the control of trichinosis are also proposed.

(2) \$35,000 for basic research and expanded activity under the project "Investigation and control of ruminant parasites," divided into:

(a) \$26,000 to obtain basic facts concerning anaplasmosis of cattle, stomach worms of cattle, sheep, and goats, hookworm disease of cattle and sheep, and lungworms of cattle, sheep, and goats. Before remedies and control measures can be provided, the basic facts of the life histories of the parasites must be ascertained. Such knowledge is not available. It is proposed to go at once into this fundamental inquiry.

(b) \$9,000 for investigations of liver flukes which produce heavy losses among livestock. Work during the past year and still in progress in a limited area in California has resulted in almost complete elimination of the parasites in that region. It is planned to extend such work to other parts of the Pacific Coast and the Southwest with a view to complete eradication, which is entirely feasible with a small increase in the appropriation.

(3) \$7,500 for additional researches in infectious abortion of cattle and swine. The increasing importance of infectious abortion, not only because of the enormous economic losses which it causes, estimated at upwards of \$50,000,000 per annum, but also because of the recent discovery that it has a significance for human health as yet unmeasured, has greatly stimulated interest in the disease through-

BUREAU OF ANIMAL INDUSTRY (continued)

out the entire country. Our present knowledge leads to the belief that much of the loss can be prevented and human health afforded a large measure of protection against whatever danger there may be to it from this malady in cattle and swine, when additional facts about it are discovered and promising methods of combating it, now under investigation, have been perfected. Much progress in gaining a knowledge of the disease has already been made but additional funds are needed to properly carry on and expand studies now in progress and to undertake new promising lines of investigation as they are suggested by results from those in progress or from other sources. It is proposed to use, for the purchase of cattle, feed, and care thereof, and for technical work in connection with the investigations, the additional sum.

(3) \$500 for special barley investigations, by transfer from the appropriation for animal husbandry investigations.

Project Statement

<u>Project</u>	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>	<u>Increase</u>
Miscellaneous patholog- ical investigations	\$ 9,918	\$ 17,517	\$ 17,517	-
Pathological investiga- tions of poultry dis- eases	4,892	21,950	21,950	-
Miscellaneous biological investigations	23,012	10,980	10,980	-
Pathological investiga- tions of anaplasmosis ..	12,430	12,265	12,265	-
Index catalog and collec- tion of parasites	7,467	9,270	9,270	-
Investigation of poultry parasites	13,143	12,195	12,195	-
Investigation of swine parasites	16,446	15,540	25,760	\$ 10,220(1)
Investigation and control of ruminant parasites ..	89,407	87,438	122,438	35,000(2)
Investigation of horse parasites	8,276	9,590	9,590	-
Investigation of miscel- laneous parasites	14,403	16,030	16,030	-
Investigation of treat- ments for internal and external parasites	6,328	13,245	13,245	-
Breeding and feeding small experiment animals for disease research	7,386	9,270	9,270	-
Investigation and control of infectious abortion.	51,951	92,500	100,000	7,500(3)

BUREAU OF ANIMAL INDUSTRY (continued)Project Statement
(continued)

<u>Project</u>	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>	<u>Increase</u>
Investigation of stock poisoning by plants	22, 269	25, 990	25, 990	-
Special barley investigations	-	3, 000	3, 500	500 (4)
Total	287, 328	356, 780	410, 000	53, 220

Activities under this AppropriationGeneral

The basic research and experimental work in animal diseases and parasites is conducted under this appropriation. It is essential to know the cause of disease and mode of dissemination, the life histories of parasites and their resistance to atmospheric conditions and chemicals before any effectual control or eradication methods may be devised and applied to either disease or parasites. This essential knowledge is gained only through research and experimentation. The bureau carries on this work independently in its laboratories and experiment stations and in cooperation with State experiment stations.

Miscellaneous pathological investigations: Laboratory examinations are made of specimens of animal tissues forwarded for diagnosis. These consist of pathological specimens encountered in the slaughtering establishments in the course of meat inspection; tissues of animals dead of suspected diseases forwarded by practicing veterinarians; and examination of the brains of animals suspected of rabies. Research investigations are made into the etiology of swamp fever and of periodic ophthalmia of horses; the complement-fixation test is applied to samples of blood serum submitted for diagnosis of dourine; blood serum of animals offered for import is examined for evidence of glanders and trypanosomiasis; etc.

Pathological investigations of poultry diseases: Laboratory and field investigations are made into the cause, treatment, and methods of control of poultry diseases. Much work is done on the accurate diagnoses of poultry diseases by microscopic methods, including post-mortem examinations. Particular attention is given to bacillary white diarrhea, an infectious malady, which causes great financial losses. Extensive research is carried on with particular reference to the origin, methods of spread, and methods of diagnosis and control of this and other diseases.

BUREAU OF ANIMAL INDUSTRY (continued)

Miscellaneous biological investigations: Work is done for the assistance of the regulatory staff in supervising the preparation and distribution of biological products, this consisting in the laboratory examination of products intended for veterinary use prepared by commercial biological houses, including examination and testing of bacterins, vaccines, aggressins, serums, and the viruses and the cultures of various bacteria entering into the production of these products. Additional investigations consist of research studies on methods of immunization against infectious diseases, as hemorrhagic septicemia, blackleg, anthrax, and rabies with a view to increasing the effectiveness of vaccination.

Pathological investigations of anaplasmosis: Anaplasmosis studies have been carried on during the past year in Florida and cooperatively in Oklahoma and Kansas. It has been shown that the recovered case remains a carrier of the infection for at least two years and young cattle are found to be more resistant than adults. Encouraging results have been obtained in the treatment of the affection by intravenous injections of an arsenical preparation. Investigations bearing on the mode of transmission of the disease have been in progress during the year and several suspected insect carriers have been the subject of experimental work, and this work is to be continued.

Index catalog and collection of parasites: The catalog is a collection of references to the subject of helminthology. It is world wide and contains all the printed references to parasites of man and animals. It consists of three parts: (1) An author catalog which lists alphabetically by authors all the titles on the subject of parasites of man or animals from any angle; (2) a subject catalog which lists the species of parasites either external or internal and is an index to the various subjects contained in the author catalog; and (3) a host catalog which lists as far as possible all the species of parasites reported to have occurred in any animal. It serves the purpose of avoiding duplication of work, saves the time of the worker by supplying information on the subject which might involve months of searching through the literature, and is constantly consulted by workers not only in this country but all over the world.

Investigation of poultry parasites: This project is concerned with all types of parasites of poultry. Particular stress is laid upon experimental work pertaining to the life cycles of individual parasites and based upon this fundamental information, in so far as it has been obtained, practical control measures have been suggested. A number of hitherto unknown life cycles of certain roundworms and tapeworms have been worked out in the past year. Work in regard to the details of the resistance and control of coccidia and other protozoan parasites of poultry and important game birds is under way. The interrelationship of the parasites of poultry and of wild birds is given considerable attention, the results of the study being of value to both poultrymen and to those interested in game birds.

BUREAU OF ANIMAL INDUSTRY (continued)

Identification of specimens and supplying information on treatment and control of parasites are part of the routine work of the project.

Investigation of swine parasites: This project covers investigations of external and internal parasites of swine to ascertain the prevalence, distribution, and importance of these pests, to ascertain the life histories of the more injurious species, and to develop treatments and control measures. Studies are in progress with regard to kidney worms, lungworms, trichinae, and nodular worms; control measures are being tested under field conditions on the basis of facts ascertained in the laboratory. During the past year the life history of the kidney worm was ascertained and important discoveries were made with regard to the mode of transmission of lungworms. Important progress was made with regard to developing a skin test for trichinosis. Lesions in edible portions of swine of importance from viewpoint of meat inspection were investigated and the cause of serious liver lesions was determined.

Investigation and control of ruminant parasites: The object is the study of the parasites of cattle, sheep, and goats. Among these are included such well-known forms as stomach worms, hookworms, nodular worms, tapeworms, liver flukes, cattle grubs or ox warbles, lice, and the ticks. The nature, prevalence, and distribution of these parasites, their life histories, and their relation to climatic conditions are studied, the damage they cause is determined, and control measures are devised. Such measures for the stomach worm of sheep in the South have been developed, the work at McNeill, Mississippi, having demonstrated that regular treatment at two weeks intervals is effective, and experiments to bring about eradication have been started. The nature of the disease of cattle diagnosed as anaplasmosis has been definitely established by experiments at Jeanerette, Louisiana, and experiments to determine the carrier and treatment are in progress. Work on practical control measures for ox warbles is being conducted in the field, with encouraging results.

Investigation of horse parasites: Studies are in progress to ascertain prevalence, distribution, and importance of horse parasites, to ascertain methods of controlling injurious species, to determine the life cycles of disease producing forms, and to develop dependable treatments for the destruction of external and internal parasites. Investigations on the length of life and survival of eggs and larvae of horse parasites under various external conditions and methods of destroying eggs and larvae in horse manure have yielded information which is applied to the control of parasites on horse farms. Methods of raising colts under conditions which preclude gross infestation with parasites have yielded successful results under farm conditions.

Investigation of miscellaneous parasites: This project includes investigations on the parasites of fur-bearing, wild, and zoological

BUREAU OF ANIMAL INDUSTRY (continued)

park animals, dogs, cats, and related carnivores with respect to their distribution and relation to parasites of domesticated animals and man; life history investigations; determination of methods for eradication and control; taxonomic and other investigations on trematodes and their diseases. A survey of the parasites of wild animals, especially those which may serve as reservoir hosts for parasites of economically important animals, is being made to serve as a basis for future work. A satisfactory method of sterilizing livers condemned on account of liver fluke has been developed, effecting a considerable saving by rendering such livers safe for use as fish food. Several trematode life histories have been solved. The pathology and injurious effects of the kidney worm have been studied and it is shown that this parasite produces profound and permanent injury to swine. New species of parasites have been described and numerous specimens identified.

Investigation of treatments for internal and external parasites: The purpose of this project is to develop new and practical treatments for internal and external parasites and to study the effect of drugs on parasites and hosts. A study on correlation and efficacy of the straight-chain chlorinated hydrocarbons has led to the development of several new anthelmintics of high efficacy and has injected new ideas into theories surrounding the mode of action of such compounds. These new remedies offer great promise in the treatment of parasites. A new treatment has been developed for whipworms in the dog. The first work to be undertaken on treatment of rabbit parasites has led to the discovery of an effective remedy for pinworms in these animals. Tests with repeated treatments have established the greater safety and efficacy of certain anthelmintics for sheep parasites and have added much valuable information of practical application to the sheep industry. Critical testing of drugs under this project has revealed the inefficacy of certain drugs long recommended as treatments.

Breeding and feeding small experiment animals for disease research: The object of this project is to provide the bureau laboratories in Washington and the Experiment Station with an adequate supply of dependable, healthy, small experiment animals, guinea pigs, rabbits, white rats, and white mice, of proper age and weight for use in the study of infectious diseases of the larger animals. From 8,000 to 11,000 of these animals are used annually and it is necessary for accurate work to have available at all times a large stock from which groups of considerable size of animals of some particular uniform age and weight may be selected. At times surplus stock is supplied other U. S. Government laboratories. This project, in providing at low cost an abundant supply of vigorous animals of uniform quality and known history, has proved to be an important one in carrying on the research work of the bureau.

BUREAU OF ANIMAL INDUSTRY (continued)

Investigation and control of infectious abortion: This most troublesome and costly animal plague has been the subject of investigation for a number of years. Investigations have revealed numerous facts which have had a direct and important bearing on the matter of control and eradication. Present studies include: Artificial immunization during calfhood, approach to maturity and during pregnancy and the proper virulence of *Bacterium abortus* cultures for vaccine preparation in immunizing procedures; the significance and value of the serological tests as a diagnostic agent in the detection of infection and in combating the malady; the duration of the periods over which *Bacterium abortus* infected pastures remain infective for susceptible stock; the value of chemical agents, administered internally, in curing the disease; changes which the abortion microorganism undergoes when subjected to different environments; the importance of the skin and the eye of the animal as channels of infection for the abortion microorganism and the interrelation of infectious abortion of cattle and swine. Methods of control, based upon sanitary management and upon the segregation and elimination of infected animals as indicated by the agglutination test, are also being subjected to field trials. Abortions due to other causes than *Bacterium abortus* are receiving some attention. Studies on other phases are conducted cooperatively with eight State universities.

Investigation of stock poisoning by plants: This project includes: (1) A study of known and suspected poisonous plants. Experimental feedings to determine whether suspected plants are toxic; if they are found, to get detailed data in regard to toxic dosage and pathological changes. These experiments are carried on mainly at field stations in the localities where losses occur, being at present centered near Salina, Utah. (2) Investigation of the parts of plants which are especially poisonous, and the stages of growth when they are dangerous. (3) A chemical study to determine what constituents of the plants are concerned in their toxic effect. (4) Study of possible methods of preventing losses. (5) The collection and arrangement of published data in regard to the subject.

Special barley investigations: This bureau is cooperating in the Department's investigations concerning scabby barley and its deleterious action on swine. Bacteriological examinations, animal feeding tests, and chemical analyses were made with samples of diseased barley, and experiments are in progress to determine practical means of removing the unpalatable principles of the affected grain.

BUREAU OF ANIMAL INDUSTRY (continued)(g) INVESTIGATION, ERADICATION, AND CONTROL OF HOG CHOLERA

Appropriation, 1930\$497,000
 Budget, 1931 497,000

Project Statement

<u>Project</u>	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>
Hog-cholera control looking to eradication	\$178,008	\$187,760	\$187,760
Investigation of methods of producing immunization against hog cholera.....	17,265	17,500	17,500
Investigation of modes of dissemination of hog cholera	12,618	13,210	13,210
Control of manufacture, importation, and shipment of viruses, serums, toxins, etc.	274,975	278,530	278,530
Total	482,866	497,000	497,000

Activities under this AppropriationGeneral

Hog cholera is the most destructive disease of swine in our country. The direct annual losses from this disease have varied from twenty to sixty-five million dollars annually. The losses for the year ended December 31, 1928, were estimated at twenty-five million dollars. The funds appropriated for hog-cholera work are used to study the disease, including the ways by which it is disseminated and the most effectual means of prevention; the supervision of the production of biological products, including anti-hog-cholera serum and virus; and to cooperate with the various States in the control of the disease with the view of preventing losses.

Hog-cholera control looking to eradication: Under this item work is carried on in the control and eradication of hog cholera in the field by such means as are necessary, including demonstrations, the formation of organizations, and other methods either independently or in cooperation with farmers' organizations and State and county authorities. This work is being carried on at present in 31 States. Meetings are held and demonstrations are made from time to time to

BUREAU OF ANIMAL INDUSTRY (continued)

gatherings of farmers and others interested in preventing losses from hog cholera. Outbreaks of cholera are investigated, swine diseases diagnosed, owners are instructed in methods to prevent losses, and local veterinary practitioners are assisted when necessary in the use of the preventive treatment. In sections of the South where no veterinary services are available, Bureau inspectors immunize swine in addition to their other duties, and in States where the laws and regulations permit, laymen are trained to immunize swine.

Investigation of methods of producing immunization against hog cholera: Sanitary measures which are practical and enforceable do not serve to control hog cholera. This project was begun with the idea in mind of developing a reliable vaccine or serum for use against that disease. An effective serum has been produced. The work under the project has been continued in order to improve the efficiency of that serum, to improve the quality of the serum, to study the methods of applying it, and to devise, if possible, cheaper means of producing it. Efforts have also been made to develop a true vaccine which, if effective, might be cheaper and simpler of application than the serum which is now the only known means of preventing the disease.

Investigation of modes of dissemination of hog cholera: Although purely sanitary measures have not proven effective in controlling hog cholera, it appears that they might be aided by an understanding of the ways in which the disease spreads. Many studies have been carried out. The relationship of insects (flies) to transmission, the life of the virus in dead carcasses and in the soil where sick hogs have been kept, have been given much attention. Likewise, the possibility of transmission by cured pork products has been studied. Investigations of this question of dissemination are proceeding since it has not yet been possible to discover any particular channel which is of such great importance that it might offer a simple means of controlling the disease.

Control of manufacture, importation, and shipment of viruses, serums, toxins, etc.: This item provides for the enforcement of the provisions of the Virus-Serum-Toxin Act, approved March 4, 1913, regulating the preparation, sale, barter, exchange, or shipment of virus, serum, and toxin, or analogous product produced in the United States and the importation of such products intended for use in the treatment of domestic animals. Under this project inspectors are now assigned to 80 licensed establishments in 61 cities of 20 States. The annual production of anti-hog-cholera serum alone is approximately one billion cubic centimeters, and hog-cholera virus sixty-three million cubic centimeters. All of the animals used in producing these biological products are inspected. Careful attention is given to sanitation, labeling, and the testing of the finished products for purity and potency.

BUREAU OF ANIMAL INDUSTRY (continued)(h) ERADICATING DOURINE

Appropriation, 1930:

Facial	\$28,000
1928 unexpended balance reappropriated	
for 1930	4,800
Total available, 1930	32,800
Budget, 1931	17,500
Actual decrease	15,300
(Apparent decrease	10,500)

The decrease of \$15,300 is explained as follows:

(1) Dourine is believed to have been eradicated from Montana and conditions on the Navajo Indian Reservation in Arizona make it appear that eradication of the disease in that State has been so nearly accomplished as to necessitate but slight expense for further inspections. The only known area in which this disease is positively known to exist at the present time is in the northern counties of Nevada. Under these circumstances a reduced allotment of funds should suffice.

Project Statement

<u>Project</u>	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>	<u>Decrease</u>
Eradicating dourine	\$ 25,115	\$ 32,800	\$ 17,500	-\$ 15,300(1)

Activities under this AppropriationGeneral

In cooperation with State livestock sanitary authorities and on Indian reservations with the Office of Indian Affairs, horses in areas where the infection of dourine is believed to exist are rounded up and samples of blood obtained for subjection to a laboratory test. Horses reacting to the test are slaughtered and owners other than Indians on a reservation indemnified by the State and Federal Government. Indemnity to Indians is paid by the Office of Indian Affairs. Surplus stallions are castrated. Wherever possible the roundup in the early summer is followed by a further roundup and retest later in the season. Horses in sections where the disease is not known to have been eradicated by one season's work are retested during the following year.

BUREAU OF ANIMAL INDUSTRY (continued)(i) ENFORCEMENT OF THE PACKERS AND STOCKYARDS ACT

Appropriation, 1930:

Facial\$385,000
 1928 unexpended bal. reappro'd. for 1930 30,000
 Total available, 1930 415,000

Budget, 1931:

Facial 380,000
 1929 unexpended bal. reappro'd. for 1931 ... 35,000
 Total estimated, 1931 415,000
 (Apparent decrease 5,000)

Project Statement

<u>Project</u>	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>
Enforcement of the Packers and Stockyards Act	\$379,857	\$415,000	\$415,000

Activities under this AppropriationGeneral

This activity embraces supervision of the business of packers, stockyard owners, market agencies, and dealers engaged in interstate commerce and includes regulation of practices and rates and charges for services rendered at stockyards. It is carried on by supervisors, auditors, engineers, and clerks located at 20 field offices. At the close of the past fiscal year there were 1,292 market agencies and 3,269 dealers at the 71 stockyards under the jurisdiction of the act. Among the varied activities of supervisors were investigations of complaints as to unfair and discriminatory practices and devices. Many of these were settled informally, while others were made the subject of formal dockets, resulting in orders to cease and desist or suspension. A few cases were taken into court either by the Government or the respondent parties. Weight supervisors gave attention to the testing and maintenance of livestock scales at stockyards, and as a result much improvement was made in the accuracy of the scales. An important activity under this project is the study that is being made of stockyard rates at ten of the leading markets. A force of engineers is engaged in making inventories and appraisals of stockyard properties, while a staff of auditors is making audits of the books and records, including complete analyses of the history of financial operations and organization of the stockyard companies. This study has been practically completed at two of the markets and arrangements are being made to hold hearings there in the near future for the purpose of inquiring into the reasonableness and the lawfulness of the rates and charges for stockyard services. At these hearings all the information which is being acquired, will be made a part of the public record, and the stockyard companies and other interested parties will be given an opportunity to introduce evidence. Similar hearings are planned at the eight remaining markets as soon as the study at those points has been completed. These hearings, involving the valuation of substantial pieces of property and complete analyses of the financial and physical operations of large companies, will require a relatively large expenditure of funds. The completion of this program will require the remainder of this fiscal year, all of the fiscal year 1931, and it is probable that some of the work will not be finally disposed of until some time during the fiscal year 1932.

BUREAU OF ANIMAL INDUSTRY (continued)(j) MEAT INSPECTION

Appropriation, 1930:

Facial	\$2,600,000
1928 unexpended balance reappropriated for 1930	20,000
Permanent annual appropriation	3,000,000
Total available, 1930	5,620,000
Budget, 1931	5,640,000
Actual increase	20,000
(Apparent increase	40,000)

The increase of \$20,000 is submitted for the following purpose:

(1) \$20,000 for increase in force. With installation of moving top viscera inspection tables in hog and cattle slaughtering departments a larger number of veterinarians to man the tables is required. This equipment facilitates the inspection and expeditious handling and disposition of the carcasses, thereby keeping the meat of the carcasses in the best possible condition. With the addition of these veterinarians to the post-mortem inspection force some lay inspectors assigned to post-mortem work will be relieved from such duties and their services will be utilized to give the necessary supervision to the handling and disposition of condemned products in a manner which produces a higher quality of inedible grease.

Project Statement

Project	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>	<u>Increase</u>
Special supervisory inspection	\$ 17,409	\$ 27,375	\$ 27,375	-
Laboratory inspection	84,605	92,365	92,365	-
Ante-mortem inspection of animals for slaughter	277,256	280,410	281,610	\$ 1,200(1)
Post-mortem inspection of animals	2,657,403	2,549,000	2,565,800	16,800(1)
Control of preparation and distribution of meat and meat food products.....	2,459,103	2,593,350	2,595,350	2,000(1)
Inspection at public markets	1,262	13,265	13,265	-
Control of operations under certificates of exemption	1,252	6,015	6,015	-
Examination of imported meats and meat food products	37,121	29,440	29,440	-
Investigation of wholesomeness and nutritive value of viscera	9,500	13,375	13,375	-

1. The first part of the document is a list of names and their corresponding addresses. The names are listed in the left column, and the addresses are listed in the right column. The names are: John Doe, Jane Smith, and Bob Johnson. The addresses are: 123 Main St, 456 Elm St, and 789 Oak St.

2. The second part of the document is a table with two columns: Name and Address. The names are listed in the left column, and the addresses are listed in the right column. The names are: John Doe, Jane Smith, and Bob Johnson. The addresses are: 123 Main St, 456 Elm St, and 789 Oak St.

3. The third part of the document is a list of names and their corresponding addresses. The names are listed in the left column, and the addresses are listed in the right column. The names are: John Doe, Jane Smith, and Bob Johnson. The addresses are: 123 Main St, 456 Elm St, and 789 Oak St.

BUREAU OF ANIMAL INDUSTRY (continued)Project Statement
(continued)

<u>Project</u>	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>	<u>Increase</u>
Investigation of pathological conditions noted during meat inspection	10,984	15,405	15,405	-
Total	\$5,555,895	\$5,620,000	\$5,640,000	\$ 20,000

Activities under this AppropriationGeneral

The purpose of the meat inspection service is to eliminate and dispose of carcasses and meat food products found to be diseased, unwholesome, or otherwise unfit for human food; to see that meat and meat food products for human consumption are prepared in a cleanly manner; to guard against the use of harmful dyes, chemicals, and other deleterious substances; to prevent the use of false or misleading names or statements on labels; and to supervise the interstate transportation, exportation, and importation of meat and meat food products. During the past fiscal year this inspection required about 2500 employees in 253 cities at 801 establishments where 73,880,000 animals were examined before and at slaughter, of which 235,000 animals and carcasses and 956,000 parts of carcasses were condemned and destroyed, and where 8,946,697,000 pounds of product were reinspected during the various procedures of preparation, of which 8,412,000 pounds were condemned and destroyed. During the year 1,228,617,000 pounds of meat and meat food products were certified for export and 169,954,000 pounds of foreign meat were inspected for entry into this country, of which 89,015 pounds were condemned and destroyed or refused entry.

Special supervisory inspection: To see that the laws and regulations governing meat inspection are properly observed. This duty is performed by members of the force assigned to the office of the Chief of the Division in Washington and by inspectors designated as traveling inspectors. The work of the stations is carefully supervised with a result that more uniform inspection, increased efficiency, and better sanitary conditions are secured.

Laboratory inspection. To ascertain whether meat and meat food products prepared in official establishments or under exemption, or those shipped interstate by farmers, as well as imported meats and meat food products, are properly labeled, sound, healthful, wholesome, and otherwise fit for human food, and to determine whether any prohibited substance has been used in their preparation, or in or about the establishment; also to determine whether the water and ice used in the preparation of meat and meat food products are potable.

BUREAU OF ANIMAL INDUSTRY (continued)

Ante-mortem inspection of animals for slaughter. To discover animals which show symptoms of or are suspected of being affected with any disease or condition which would probably cause their condemnation in whole or in part when slaughtered and to hold such animals apart and slaughter them separately from other animals so as to insure careful post-mortem inspection as provided in the regulations governing Federal meat inspection.

Post-mortem inspection of animals: To make careful examination and inspection of the carcasses and parts of all cattle, sheep, swine, goats, and horses slaughtered at official establishments to determine the presence of any lesions of disease or other condition which might render the meat or any organ unfit for food purposes; and to condemn and cause to be destroyed for food purposes all carcasses or parts thereof of animals found on final inspection to be unsound, unhealthful, unwholesome, or otherwise unfit for food.

Control of preparation and distribution of meat and meat food products: To inspect meat and meat food products prepared within and brought into official establishments and in departments thereof to see that no unfit meat or product is used in the various processes of preparation, packing, smoking, canning, etc., to insure proper labeling, and to see that establishments are maintained in a sanitary condition, that the workers are clean as to person and raiment, and that deleterious preservatives or ingredients are not used; and otherwise to enforce compliance with the meat inspection law and regulations.

Inspection at public markets: To give the necessary inspection that portions of inspected and passed meats and meat food products which, when cut or otherwise removed from a marked carcass, part, or container do not show the inspection legend are so marked that they may be eligible for interstate transportation or for exportation.

Control of operations under certificates of exemption: To ascertain whether or not shippers are retail butchers, retail dealers, or farmers and therefore entitled to exemption under the meat inspection law; also to see that the premises in which animals are slaughtered or where meat and meat food products are prepared by or for persons who make interstate shipments under exemption from inspection are maintained in a sanitary condition, and that the articles so shipped are sound, healthful, wholesome, and fit for human food.

Examination of imported meats and meat food products: To prevent the importation of meat and meat food products of cattle, sheep, swine, and goats which are not properly certified or which are falsely labeled, or which are unsound, unhealthful, unwholesome, or otherwise unfit for human food, or which contain any prohibited dye, chemical, preservative, or other harmful ingredients.

BUREAU OF ANIMAL INDUSTRY (continued)Investigation of wholesomeness and nutritive value of viscera:

While in a general way it has been understood that different parts of meat carcasses vary somewhat in nutritive value, exact information on this score has been lacking, particularly with respect to such important food constituents as the vitamins. The objects of this study are to determine the nutritive value of the proteins of the different parts of the animal carcass; also to determine the content of these different portions in the vitamins A and B. It has been discovered that pork meat is abundantly supplied with the water-soluble vitamin B. The pork meat appears to be unique among meats in this respect. The work is continuing with the idea of determining the suitability for food of portions of the carcass not now employed to any great extent.

Investigation of pathological conditions noted during meat inspection: This work is concerned with rendering diagnoses of the lesions encountered in the routine of packing house inspections. Obsolete lesions frequently require considerable time in order to determine the character of lesions to pass judgment on the fitness or unfitness of the meat for human consumption. Aside from this the differential diagnosis of diseases is important and many specimens are handled in this manner every year. Branch laboratories are maintained in Chicago, Omaha, and Denver where many specimens are examined and diagnosed. Experimental work to determine the diagnosis is often performed.

(k) ERADICATING FOOT-AND-MOUTH AND OTHER CONTAGIOUS
DISEASES OF ANIMALS

Appropriation, 1930:

1929 unexpended balance reappropriated for 1930, \$1,639,465.54, of which it is estimated there will be used ...	\$100,000
Estimate for 1931 for further use of the unexpended balance	100,000

Project Statement

<u>Project</u>	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>
Eradication of foot-and mouth disease	\$ 202,906	\$ 90,000	\$ 90,000
Eradication of European fowl pest	6,491	10,000	10,000
Total	209,397	100,000	100,000

Activities under this AppropriationGeneral

Foot-and-mouth disease, and many other serious animal maladies do not exist in this country. The prompt discovery of outbreaks which

BUREAU OF ANIMAL INDUSTRY (continued)

may occur, and their eradication with the least possible delay, are essential if the interests of our livestock producers are to be safeguarded adequately.

Eradication of foot-and-mouth disease: The work under this project is carried on by investigating immediately all reports of outbreaks among livestock in any way suspicious of foot-and-mouth disease. Trained veterinarians are assigned to public stockyards to keep a sharp lookout for symptoms of the disease. An outbreak of foot-and-mouth disease which occurred during the past fiscal year in the vicinity of Los Angeles, California, was promptly eradicated. In carrying on eradication work, inspections are made of all susceptible animals in infected localities. Diseased and exposed ruminants and swine are slaughtered, the owners being reimbursed the appraised value of the animals and property destroyed. Infected premises are thoroughly cleaned and disinfected under official supervision. The work is cooperative, the Department and the States concerned sharing the expenses for animals slaughtered and property destroyed on a 50-50 basis. The outbreak in California involved the slaughter of 277 cattle, 3,291 swine, and 23 goats, with a total appraised value of \$107,539.

Eradication of European Fowl pest: Reports of trouble among poultry in any way suspicious of European fowl pest are promptly investigated. As a precautionary measure to prevent the dissemination of the disease in the event an outbreak should occur, cars used in the interstate transportation of live poultry are cleaned and disinfected under bureau supervision. During the past year 10,492 poultry cars were so treated. An outbreak of this disease which occurred in New Jersey during the fiscal year 1929 was quickly eradicated. The procedure followed in combating this infection is somewhat similar to that used in foot-and-mouth disease eradication work, with the exception that the Department does not participate in the reimbursement of owners for losses incurred in the slaughter of diseased and exposed birds.

CHANGES IN LANGUAGE

Introductory paragraph

The language of the introductory paragraph has been amended by striking out the words and figures "and the provisions of the Act of May 9, 1902 (U.S.C., pp.624,625,sec. 25), extending the inspection of meats to process butter, and providing for the inspection of factories, marking of packages, and so forth", and also by eliminating the words "dairy" and "other" from the clause which reads "and to enable the Secretary of Agriculture to collect and disseminate information concerning livestock, dairy, and other animal products." Prior to the creation of the Bureau of Dairying and separate provision for its support in the Agricultural Appropriation Act, certain enabling authority regarding process butter was annually carried in the introductory paragraph under the "Salaries and General Expenses" appropria-

tion of the Bureau of Animal Industry, and this language has continued to be carried up to the present time. These eliminations are proposed simply for the reason that they are no longer needed under the Bureau of Animal Industry.

(b) Inspection and Quarantine

The language of this item has been amended by eliminating "together with \$15,000 of the unexpended balance of the appropriation for this purpose for the fiscal year 1928."

(c) Eradicating Tuberculosis

The language of this item has been amended by eliminating the immediately available provision and also the provision regarding payments from the appropriation of May 16, 1928, for animals condemned after the date of the approval of that Act. Since this provision has served the purpose for which it was intended, it will not be required for the fiscal year 1931.

(e) Animal Husbandry Investigations

The language of this item has been amended by omitting the proviso concerning the United States sheep experiment station in Clark County, Idaho. This language, which has appeared in the item for a number of years, is omitted inasmuch as authority for the work and the money therefor is carried in the language of the appropriation above. This change is merely one of language to clarify the item, no reduction in the estimates being possible under the existing conditions of necessary buildings now planned and under construction.

(h) Eradicating Dourine

The language of this item has been amended by striking out the following phrase: "of which \$5,000 shall be immediately available, together with \$4,800 of the unexpended balance of the appropriation for this purpose for the fiscal year 1928."

(j) Meat Inspection

The language of this item has been amended by omitting the following: "together with \$20,000 of the unexpended balance of the appropriation for this purpose for the fiscal year 1928".; also, "Provided, That the Department of Agriculture may, upon request of any branch of the Federal Government, perform inspections of food and other products and receive reimbursement of the cost of such inspections, including salaries and expenses, out of appropriations available therefor." This latter elimination is proposed only in view of the insertion elsewhere in the Agricultural Bill of a general provision to cover inspections of this nature.

Note.-- Also see Miscellaneous Section for "Experiments in Livestock Production in Southern United States", "Livestock Production in Western United States," and "Services to Other Departments".

BUREAU OF DAIRY INDUSTRY(a) GENERAL ADMINISTRATIVE EXPENSES

Appropriation, 1930	\$67,000
Budget, 1931.....	67,000

Activities under this appropriation

The work conducted under this appropriation involves the general administrative and service activities of the bureau, such as personnel, accounts, property, mail and files, editorial, and engineering.

(b) DAIRY INVESTIGATIONS

Appropriation, 1930.....	\$520,500
Budget, 1931.....	570,000
Increase.....	49,500

While there is an apparent increase of \$49,500 in this item, there is an actual increase of \$69,100 recommended in working funds, due to dropping of non-recurring items totaling \$19,600 (milking machine \$10,000, equipping laboratory \$2,000, and manure shed, \$7,600) which are offset by increases submitted for 1931 for the following purposes:

(1) \$7,600 for Dairy Manufacturing Investigations and Introduction.

The work of this project involves the application of scientific knowledge to the practical operation of creameries and cheese factories, and the introduction into creameries and factories of new or improved processes of manufacture developed in the Bureau laboratories. In the past, the Bureau has confined its activities under this project largely to the Southern States, and as a result there has been a tremendous increase in the number of creameries in that territory. Requests for assistance in working out manufacturing problems are constantly being received from other sections of the country, but these demands which should be met cannot be fully complied with because of insufficient funds. The increase recommended will enable the Bureau to better organize the work with a view to rendering more efficient and effective service.

(2) \$8,000 for Dairy Herd Improvement Investigations. In order to meet the increasing demands from the States for assistance it will be necessary to increase the technical and clerical force, and provide additional funds for travel.

The cows on test in dairy-herd-improvement associations have at present an average production of 7,457 pounds of milk and 294 pounds of butterfat. All dairy cows in the United States have an average milk production of 4,600 pounds and an average butterfat production of about 180 pounds. In

BUREAU OF DAIRY INDUSTRY (Continued)

butterfat production the tested cows excel the others by 114 pounds a year per cow. At the low price of 40 cents a pound this additional butterfat has a market value of more than \$45 per cow. The number of cows on test in dairy-herd-improvement associations on January 1, 1929, was 465,804, therefore the total value of butterfat produced by these tested cows in excess of the average of all other cows has a value of approximately 21 million dollars. While a part of this increased value is offset by the increased cost of feeding the high producing cows, at the outside the additional feed would cost no more than 10 million dollars, leaving a net profit of about 11 million dollars.

Through the statistical studies made in the Bureau, the work of these associations is measured and methods of improvement are discovered and pointed out. The production of the cows on test has advanced since 1920 from an average of 5,989 pounds to 7,457 pounds of milk per cow and the production of butterfat has advanced from 247 pounds to 294 pounds per cow. Our recommendations have been to eliminate inferior and unprofitable cows from our dairy herds, and to maintain present production with fewer but better cows. This will effect a tremendous saving in feed costs, give the dairy farmers greater profits, and at the same time lessen the danger of a surplus. Without the statistical studies to measure progress from year to year and to point out methods of making still further improvements in the feeding, breeding, and general management of these herds it is certain that progress toward dairy herd improvement would be greatly retarded.

The work is growing rapidly and new problems are constantly appearing. Between January 1, 1928, and January 1, 1929, the number of associations in the United States increased from 947 to 1,090 and the number of cows on test increased from 414,891 to 465,804, a gain of 143 associations or 15 per cent and a gain of 50,913 cows on test or 12 per cent. Our work in connection with statistical studies of these records is increasing more rapidly than the number of associations is increasing because each year we are receiving a larger percentage of the records, each year we add to the number of studies to be made, and each year we are rendering more service to the States than ever before.

(3) \$13,500 for Dairy Cattle Breeding, Feeding, and Management Investigations, as follows:

(a) \$9,000 for cooperation with State Experiment Stations. It is proposed to further extend the fundamental feeding and breeding experiments now being conducted at field stations to other Western States where climatic and feeding conditions differ from those prevailing at Bureau Field Stations. The work will be carried out on farms now owned and equipped by the States, and will be financed jointly by the Government and the States concerned. The amount estimated is to provide for the Government's contribution toward the salaries and expenses of cooperative employees in three States, namely, Washington, Utah, and one other Western State not definitely decided upon at the present time.

(b) \$4,500 for additional personnel and travel expenses. Additional assistance is urgently needed in connection with investigational work in the feeding and management of dairy cattle, and the periodical inspections of bulls which are placed with farmers from the Beltsville herd for the purpose of proving their hereditary factors for transmitting uniformly high milk and butterfat producing capacity. The Bureau now has 90 young bulls from its herds placed with farmers in the States of Maryland, Virginia, and Pennsylvania, who are cooperating with it, and it has not been possible in the past to give this work the close supervision necessary because of insufficient personnel and funds for travel.

Additional funds are also required in connection with the supervision of investigational work being conducted at the seven field stations maintained by the Bureau. These stations are widely scattered and the cost of travel in connection with their supervision is constantly increasing because of the establishment of new stations. Three new stations have only recently been established and provision has not been made to meet the increased cost of supervision.

Many fundamental problems in dairy cattle feeding and management which give promise of excellent results cannot be prosecuted as vigorously as their importance warrants because of insufficient personnel.

4. \$6,400 for Dairy Research Laboratories, as follows:

(a) \$1,500 for Butter and By-Products Investigations. This increase and that indicated under the following item are recommended for the purchase of laboratory supplies and equipment. The experimental work on some of the by-products is hampered by a lack of funds for the purchase of equipment needed in the manufacturing work. Experimental work in the manufacture of milk sugar, casein, and other by-products is urgently necessary but funds for the purchase of experimental equipment are not now available.

(b) \$1,000 for Bacteriology and Chemistry of Milk.

(See preceding note)

(c) \$3,900 for Nutrition of Dairy Cows. The chemical analysis of feeds is an important phase of the work conducted under this project and the project Dairy Cattle Breeding, Feeding, and Management. In the past, when the number of analyses was not great it was possible to obtain assistance from another bureau of the Department. However, the work has now increased to such an extent that the full time of one chemist is needed for the purpose. Funds available under this project for the purchase of necessary supplies are entirely inadequate for the proper maintenance of the laboratories. The cost of supplies is constantly increasing, additional equipment is urgently needed, and certain equipment which has been in use for a number of years should be replaced.

BUREAU OF DAIRY INDUSTRY (Continued)

5. \$5,000 for Market-Milk Investigations. The program of work of the Bureau contemplates an extensive plan for the sanitary improvement of milk supplies. Such work is of vital importance not only for the safeguarding of health on the farms and in the cities, but for the profitable conduct of the dairy industry. Milk and cream of low sanitary quality cause a loss carefully estimated to be about 40 million dollars annually. Such products are either unsalable or capable of being manufactured into only low-grade products which sell at low prices. Additional help is necessary to conduct fundamental investigations regarding the causes and prevention of defects in quality, to study specific problems of individual milk supplies, to study methods of quality control now in use by individuals and organizations, and to plan and assist in the introduction of appropriate and efficient methods of quality improvement in dairy areas.

6. \$18,600 for the Beltsville Experiment Station, as follows:

(a) \$11,000 for purchase of additional land. This increase will provide for the acquisition of approximately 80 acres of land adjoining the Beltsville, Maryland, dairy farm on the south. This land is now under lease and may be purchased during the fiscal year 1931 for the sum of \$11,000. There is an urgent need for specific information on the feeding value of different types of silage and the effect of different methods of pasturing on the carrying capacity of pastures and the milk and butterfat production of dairy cows. The Bureau is conducting investigations along these lines only in a limited way because sufficient suitable land is not available. It also has been demonstrated that certain types of feed can be produced cheaper than they may be purchased. The total area of the Beltsville dairy farm is 314 acres of which it has been necessary to utilize 129 acres for the isolation of a part of the herd infected with contagious abortion. Of the remaining 187 acres approximately 15 acres are used for buildings, pens, etc., leaving only 172 acres available for pasture and for the production of forage crops.

(b) \$7,600 for construction of building. A building is urgently needed at the Beltsville farm in which to house animals that are being utilized in physiological experiments in milk secretion; for killing and making post-mortem examinations of animals for the purpose of obtaining anatomical data bearing on the relation of conformation to milk producing capacity; to provide facilities for an operating room, and hospitalization of sick and crippled animals; and for handling maternity cases. At the present time part of these activities are conducted in the frame barn formerly used for work stock which it will be necessary to raze shortly, while sick animals and maternity cases are handled in a barn that was originally constructed for the storage of feed. The present facilities are wholly inadequate and undesirable from the standpoint of sanitation. In addition the utilization of the feed barn for purposes other than the storage of feed so limits the storage space that quantity purchases of feed are not possible. The proper utilization of this barn will make it possible to purchase feeds in much larger quantities and effect considerable savings in feed procurements.

BUREAU OF DAIRY INDUSTRY (Continued)

7. \$10,000 to enable the Department to cooperate with the Missouri Agricultural Experiment Station in developing a dairy experimental station on the Hatch farm located near Hannibal, Missouri. The land was formerly owned by the Hon. William Hatch, deceased, who was author of the original legislation covering the establishment of State agricultural experiment stations, and has been turned over to the State of Missouri for experimental work in agriculture. The amount recommended for expenditure by the Federal Government will be devoted to investigations in dairy cattle breeding, feeding and management. The rapid development and present importance of the dairy industry in the region that would be served by this station will make it very desirable to have a station at this point, and due to the cooperative feature will permit the operation of a regional station at a very nominal cost so far as the Government is concerned.

Project Statement

Project	<u>Expended,</u> <u>1929</u>	<u>Estimated,</u> <u>1930</u>	<u>Estimated,</u> <u>1931</u>	<u>Increase</u>
Dairy Manufacturing Investigations and Introduction	\$55,613	\$63,690	\$71,290	\$ 7,600 (1)
Dairy Herd Improvement Investigations	61,051	52,500	60,500	8,000 (2)
Dairy Cattle Breeding, Feeding, and Management	55,222	150,950	152,450	1,500 (3)
Ice Cream Investigations	14,307	13,100	13,100	....
Butter & By-products Investigations .	20,435	26,036	27,536	1,500 (4a)
Condensed Milk & Milk Powder Investigations	30,080	32,660	32,660	....
Investigations in Bacteriology & Chemistry of Milk	19,643	19,610	20,610	1,000 (4b)
Nutrition of Dairy Cows.....	38,403	45,560	49,460	3,900 (4c)
Cheese Manufacturing Investigations .	22,106	32,760	32,760	....
Market-Milk Investigations	33,790	35,552	40,552	5,000 (5)
Operation & Maintenance, Beltsville Farm	116,106	48,082	59,082	11,000 (6)
Dairy Experiment Station, Missouri ..	....	....	10,000	10,000 (7)
Total	\$466,756	\$520,500	\$570,000	\$49,500

BUREAU OF DAIRY INDUSTRY (Continued)Activities under this AppropriationGeneral

Under this appropriation investigations are conducted of the fundamentals of the dairy industry. Such investigations embrace the breeding, feeding and management of dairy cattle; the importance of minerals in maintaining milk yield, growth, and reproduction; market-milk investigations; the manufacture of Swiss and other so-called foreign cheeses; bacteriological and chemical problems of milk; the manufacture of condensed and evaporated milk and milk powders, including the keeping qualities of milk powder; the manufacture of by-products and the effective utilization of skim milk through manufacturing processes; bacteriological and other problems in the manufacture of ice cream; the economical increase in milk and butterfat production of dairy cows in dairy herd improvement associations; the introduction into new territories of improved processes for the manufacture of butter, cheese, and other dairy products and by-products; and supervision of factories engaged in the manufacture of renovated butter.

Dairy manufacturing investigations and introduction: (a) The investigational work involves studies of the influence of various factors on flavor, body and quality of dairy products, and the efficiency of operation of creameries and cheese factories. A manufacturing plant is maintained at Grove City, Pa., where methods are developed for applying to commercial conditions the results obtained in laboratory. (b) Better Manufacturing methods are being introduced into a number of factories in the South. At one plant correction in methods of handling curd have resulted in increasing the receipts from the sale of cheese at the rate of \$4,000 a year. Proper pasteurization instruction at another plant has resulted in increasing the income of the factory at the rate of \$9,000 a year. Eighteen factories were assisted in making Swiss cheese by the culture method. One and one-half million pounds of such cheese were made in Ohio and 386,486 pounds in New York State. All culture cheese was marketed advantageously and was of fine quality, a higher price being paid by the factory for milk than formerly. (c) The renovated butter work which is mandatory under statutory provision involves the inspection of factories licensed to manufacture renovated butter and the materials used in the manufacture of that product.

Dairy herd improvement association investigations include a study of the methods of organization, reorganization, operation, and supervision of dairy herd improvement associations. Uniform plans for carrying on the work in the States are then worked out and put into operation. A recent statistical study of the records of 152,000 cows on test has shown that the income over cost of feed advanced rapidly and quite regularly as production per cow increased from the lowest to the highest producing group. The figures show that the average yearly income over cost of feed was \$15 per cow for cows producing 100 pounds butterfat, and \$214 for cows producing 500 pounds. They also showed that feed for cows whose average yearly milk production was 9,200 pounds cost only about 40 per cent more than for cows that produced half as much.

BUREAU OF DAIRY INDUSTRY (Continued)

Another study showed that within the breed and for cows of the same age the larger the cow the greater her production and income above feed cost. The average production of all cows on test for the testing year 1928 was 7,464 pounds of milk and 295 of butterfat. This is a gain of 1,475 pounds of milk and 48 pounds of butterfat since 1920, and is 60 per cent more than the estimated production of the average cow in this country. The number of associations has increased from 6 in 1908 to 1,090 on January 1, 1929. On the latter date there were 26,182 members having 465,804 cows on test. Another study showed that those cows producing 4,600 pounds of milk, the production of the average cow in the U.S., returned approximately \$58 in income above feed costs, while the cows producing 7,464 pounds, the production of the average dairy-herd improvement association cow, returned approximately \$116. If all the cows in the country were as good producers as those in dairy herd improvement associations the present volume of production would be obtained from 8,000,000 fewer cows. At the same time this milk would be produced at a lower unit cost, and therefore, more economically. The saving in feed cost of 28 cents per hundred-weight of milk, as shown above, would amount to 280 million dollars on the present annual volume of production. A study is being made to bring about a more effective utilization of meritorious proved bulls. The real value of a bull can be determined only by comparing the yearly production of his daughters with the yearly production of their dams. Of 800 purebred sires that have been proved in this way only about 120 were known to be alive when they were proved. More extensive use of high-class purebred bulls is essential for high production per cow. When purebred bulls were mated with cows of average production the daughters produced on an average 120 pounds more butterfat than their dams. A study of the effect of feeding practices on milk and butterfat production gave results that were very favorable to the feeding of legumes and silage. As a rule a liberal feeding of grain was necessary for high average production and high average income over cost of feed. In some districts of the West, however, where herds were fed liberally on alfalfa hay with a long pasture season, high average production and income over cost of feed were maintained with little or no grain and without silage.

Dairy cattle breeding, feeding, and management. The work under this division is divided into five projects, namely, General breeding investigations, feeding and management investigations, fertility studies, studies of relation of conformation to milk and butterfat production, and statistical studies. During the fiscal year 1931 it is proposed to add a new line of work to be known as cooperative feeding and breeding investigations. In the general breeding investigations, line bred animals are compared with those outbred generation after generation, and also those inbred. So far, results of the work indicate that selection need not be confined to animals of the same family so long as the bulls have a high degree of homozygosity, (purity) for the hereditary factors determining high production. To determine the transmitting ability of the bulls born in the experimental herds they are lent to farmers in the vicinity of the stations. Once pure-line herds are established and kept pure, it is expected that the production of the herds of the country will rapidly be raised by the use of bulls from these herds. The dairy cattle experiments completed or now in progress, cover a wide range of feeding and management problems, such as the stabling and exercising of dairy cows, use of

BUREAU OF DAIRY INDUSTRY (Continued)

bedding materials, making of silage, effect of different frequencies of watering and milking, use of various feeds, grain requirements of dairy cows on dry feed and on pasture, carrying capacity and improvement of dairy pastures, and the feeding of dairy calves. Short-time trials sufficed for some of these experiments, while others required several years' data for complete information. A new phase of the feeding and management work recently undertaken is based on the European or Hohenheim system of pasturing, fertilization, and rotational grazing that has resulted in a greatly increased carrying capacity on many European pastures.

Some of the results of these investigations are briefly summarized as follows: Cows milked three times a day gave 22.1 per cent more milk and 23.6 per cent more butterfat than those milked only twice daily. Cows housed in open sheds produced slightly more milk than those in closed barns but at a greater cost for feed and slightly more labor and bedding. Cottonseed meal in varying amounts up to 10 pounds per cow daily over periods of from 3 to 17 months, when combined with the proper roughage and concentrates, may be safely fed in amounts necessary to supply protein requirements. The old theory, that if cows are fed all the roughage they will eat, Jerseys being given one pound of grain for each three pounds of milk produced and Holsteins one pound of grain for each 4 pounds of milk produced, is based on the erroneous supposition that roughage will supply only the cow's maintenance requirements, with the result that low producers are overfed and high producers are underfed. An improved method of machine milking has been devised which is giving excellent results in the production of high quality milk.

The purpose of the fertility studies is to determine proper methods of feeding and handling to insure efficient service of bulls to old age and to prevent and control conditions in females which bring about failure to conceive. It has been found that exercise and the feeding of sprouted oats increase the activity of the spermatozoa and increase the usefulness of the bull. Rejuvenation of a sterile, eight year-old bull was accomplished by grafting tissue, although rejuvenation did not take place in older bulls from eleven to seventeen years old. A total of 23 cows and 25 heifers at the Beltsville, Maryland, farm has been relieved of temporary sterility through the feeding of sprouted oats. Other studies involve the photographing of all animals in the breeding herds of this bureau at regular intervals throughout life, determinations of the fluid holding capacity of the secretory system of udders, and a detailed study of the conformation, the anatomy, and the skeletal structure of a highly specialized dairy cow and a highly specialized beef cow. The photographic work has demonstrated that animals show remarkable changes in conformation during their development; also that little if any relationship exists between the conformation of a dairy bull and his ability to transmit high producing capacity to this offspring.

In another study to determine whether a cow secretes milk continuously or chiefly during the process of milking, the udders of cows killed at the exact hour of regular milking were amputated. The milk in these amputated udders was then drawn and the quantity and composition was compared with that of the milk obtained at corresponding milkings before the cows were killed. The results showed that a large proportion of milk is present in the udder before milking is commenced. The udder tissue closely resembles a sponge. It absorbs water, and when subjected to pressure is readily compressed and the water is forced out. When reimmersed in water it expands to its original

BUREAU OF DAIRY INDUSTRY (Continued)

size and recovers all the water previously expelled by pressure. The sponge-like character of the tissue rather than the size of the cistern is believed to account for the large fluid holding capacity of the udder. A study of the anatomy and the skeletal structure of a highly specialized dairy cow and a highly specialized beef cow has shown that the greatest difference, aside from the outward form, is in the quantity of secretory tissue of the udder. The udder of the dairy cow was found to be composed almost entirely of secreting tissue while the udder of the beef cow consisted of a large quantity of solid body fat within which was an almost negligible quantity of gland tissue. Statistical studies of advanced register records have shown that (a) the present Holstein-Friesian breed is descended from five foundation sires, two of which are sons and another is a grandson of the same cow. (b) It is possible to determine more accurately the hereditary make-up of a sire for transmitting high producing capacity by comparing the records of a number of his daughters with the records of their dams than to determine this make-up of a dam by her production record alone.

The manufacture of ice cream: This work includes studies of the physical properties of the various ingredients and of their combination in the ice cream mix, and the relation of these physical properties to the quality, yield, and the stability of the ice cream in storage. The effect of the manufacturing processes on the viscosity of the mix and the relation of this viscosity to the yield, has been determined. It has also been found that when milk powder is used as a source of milk solids-not-fat the quality of the ice cream is distinctly improved by using powder made from milk pre-heated to a relatively high temperature.

Butter and by-products investigations: The object of investigations conducted under this project is the better utilization of skimmed milk, whey, and buttermilk. Such investigations are as follows: (a) Studies of the physical and chemical properties of milk sugar and of the possibilities of finding in the food industries applications to which these peculiar properties are suited. The fact that milk sugar does not take up moisture until the atmosphere is nearly saturated has been established, and a factory method of making a sweet and soluble form of milk sugar has been developed; (b) Studies of the physical and chemical properties of lact-albumin and the minor milk proteins. A method has been perfected for separating milk sugar from whey so that a soluble powder is obtained containing about 35 per cent of protein. This may be used as a stabilizer in salad dressings and other emulsions. Progress has been made on a method of removing the salts from the powder so that it will be suitable for modifying infant foods; (c) Investigations of the factors which influence the quality of cultured buttermilk, including the effect of heating on viscosity and stability, the concentration of solids on the body, the relation of the cultures used to the flavor, and the possible standardization of methods which will insure a uniformly good product. It has been established that the temperature to which the milk is heated has no effect on the stability or viscosity except as it concentrates the solids.

Evaporated milk and milk powder investigations: This project involves investigations of the factors influencing the quality of evaporated and condensed milk and milk powder; a study of the cause of defects and methods for their correction; and the development of new uses and improvements in methods of manufacture which will make these products especially adapted to particular uses, as follows: (a) A study of the properties of milk and its products which are concerned in heat stability, and the effect of heat on milk and its products. Some of the important factors which control the stability of evaporated milk in the sterilizer have been determined. A method of sterilizing cream with a minimum effort on color and flavor has been perfected. The factors which determine the color of evaporated milk have also been worked out. (b) Investigations of the causes and control of crystal formation in evaporated milk. The nature of the crystals has been determined and some of the conditions under which they are formed have been established; (c) Studies of the deterioration of milk fat and its relation to the development of off flavors in milk powder, butter and other dairy products. The conditions which accelerate or retard oxidation of fat in milk powder have been determined and a method perfected by which the keeping quality of fat can be predicted; (d) Studies of the properties of dry milks manufactured from different types of milk and by different processes of manufacture. It has been found that by subjecting milk before drying to special heat treatment the powder is more effective in improving the loaf when used in bread making and that it is more satisfactory for ice cream making. The relation of the properties of the milk powder and of different types of flour has been worked out.

Bacteriology and chemistry of milk: Investigations are being conducted of the fundamental problems of the bacteriology, chemical composition, and physical and chemical reactions of milk as a basis of improving methods of handling milk and for manufacturing milk products, as follows: (a) Studies of casein digesting bacteria of milk and the process through which bacteria obtain their nitrogen supply. The entire group has been described and classified and results obtained on their effect on different milk constituents; (b) Studies of the conditions inducing the beginning of bacterial growth, the rate of multiplication and fermentation, and the growth and death of cells. Information has been obtained on the factors which cause the multiplication of lactic bacteria to cease when a certain population is reached and a method devised for making commercial fermentations continuous instead of intermittent; (c) Studies of the influence which different species of bacteria exert on each other when growing together. The inhibiting effect of one variety of lactic bacteria on another has been demonstrated and an explanation provided for one of the difficulties encountered in making concentrated buttermilk. It has been found that certain varieties of milk bacteria grow more rapidly in mixed than in pure cultures; (d) Studies of the conditions which control the formation and germination of heat resistant bacterial spores. Some of the factors which control the germination of species have been determined; (e) The development of methods for determining the quality and suitability of milk for manufacturing purposes. A method by which the heat stability of milk can be quickly determined has been perfected. This is applicable to condenseries in which the coagulation of the evaporated milk in the sterilizer is a problem; (f) Studies

BUREAU OF DAIRY INDUSTRY (Continued)

of the acidic and basic constituents of milk, their buffer intensities, and their relationships to coagulation of milk and to the type of curd formed. A marked difference has been found in the buffer value of milk from two of the dairy herds with a consequent variation in the reaction of the two milks in cheese making; and (g) Determination of the factors involved in oxidation-reduction of potential changes in milk and the application of this knowledge to the problems of grading milk, preserving milk, controlling the type of fermentation in milk, and utilizing dairy by-products. The potentials established in milk by bacteria growing in milk in pure and in mixed cultures, have been determined.

Nutrition of dairy cows: Three major lines of investigations are conducted under this project:

(a) A study of protein metabolism to determine and amino acid requirement of cows for maintenance, growth and lactation, including determinations of which of the 20 amino acids occurring in feeds are essential, the chemical nature of non-protein nitrogenous material in feeds, and the optimum level at which protein should be incorporated in the ration; (b) Determination of the feeds which are essential in maintaining high producing cows at their optimum level of production and in good health through their normal length of life, including studies on the species, grade and amount of hay, and the pathological effects of feeding roughage either unsatisfactory in species and quality or too small in amount; and (c) Investigation on the importance of vitamins in the rations of dairy cows to determine the kinds of hays which must be furnished to supply necessary vitamins and methods of handling the hay to secure the maximum effect.

Progress has been made in determining the value of the polypeptide which occurs in the blood and which is the precursor of cystin, and important amino acid of casein. Preliminary work with white rats indicates that valine, one of the amino acids of feeds, is not essential in the maintenance of these animals.

Differences in the vitamin content of different grades of hay have been established, as has the fact that under certain conditions, at least, unfavorable effects are produced by continued use of alfalfa as the only roughage.

An extensive rat colony has been established and it has been found that rats may be maintained on dairy cow rations supplemented by casein and butterfat. Work is under way to determine what substances are supplied by casein and butter, or which are lacking in the ordinary ration.

Cheese manufacturing investigations: Work under this project involves studies of the basic biological and chemical factors which control the normal ripening of cheese and the application of information so obtained to improve

BUREAU OF DAIRY INDUSTRY (Continued)

the quality of domestic cheese and promote the manufacture of cheese of varieties now imported from other countries. The investigational work includes (a) Studies of the bacteria essential to the production of the characteristic flavor and eyes in Swiss cheese, and the use of pure cultures of bacteria in the factory. Three types of bacteria, all of which are essential to the proper ripening of the cheese, have been isolated. By the use of these cultures in commercial factories a high percentage of first grade cheese has been secured. (b) Determination of the bacteria and manufacturing methods necessary to make Parmesan and other hard cheeses of that type. Some progress has been made and experimental cheese approaching closely to the typical Italian cheese have been produced. (c) The development of methods by which cheese may be put in marketable packages without destroying its normal characteristics. A method of wrapping small prints of cheddar, Roquefort, and other hard cheeses has given satisfactory results under laboratory conditions and will be given a factory trial. A special type of can has been perfected which prevents molding and permits the escape of gas formed in the normal ripening of the cheese. This should make it possible to can cheddar cheese as it comes from the press.

Market milk investigations: The work of the Division of Market-milk Investigations is divided into three main projects, which are in turn subdivided into 13 sub-projects, as follows:

1. Dairy Sanitation.

Bacteriological studies in milk plants.
Improvement of milk supplies.
Control of flies on dairy farms.
Service in sanitation to Government departments.
Studies in dairy sanitation.

2. Milk-Plant management.

Country milk-receiving stations.
Milk-plant studies.
Bottle breakage in milk plants.
Construction and arrangement of small milk plants.

3. Market milk and cream.

Transportation of milk and cream.
Viscosity of cream.
Flavor and odor of milk and cream.
Miscellaneous studies of factors effecting marketability.

Dairy sanitation: This project has to do with the development, intensive study, and testing under field conditions of equipment and methods which aid in the efficient and economical production and handling of milk and cream not only for city milk supplies but for manufacturing purposes. The American dairy farmers lose at least \$40,000,000 annually from low grade milk and cream.

BUREAU OF DAIRY INDUSTRY (Continued)

In addition to these studies dairy inspectors are assisted in efficient and reasonable methods of dairy farm inspection.

Milk plant management: This project involves investigations on economical methods of handling, receiving, and preparing milk for the market and includes studies on utilization of labor, machinery efficiency, wastes in the plant such as spilled milk and broken bottles. Data are obtained which result in economies in the handling of milk from the producer to the consumer. It is extremely important that the efficiency of milk plants be increased so that there is no undue waste in the processing of milk which would result in either lower prices to the producer or higher prices to the consumer, both of which react unfavorably on the farmer's market for milk and cream. The information gathered is of much use not only to the larger dealers but to small producer-dealers, and cooperative dairymen's organizations.

Market milk and cream: This project covers a number of factors involved in the palatability and marketability of milk and cream. By careful studies of various feeds and feeding methods, the manner in which certain undesirable flavors are transmitted to the milk has been discovered and a system has been worked out whereby certain feeds formerly considered undesirable from the standpoint of flavor and odor may be safely fed without harming the product.

The cost and efficiency of transporting milk from the country to the city by different methods are being studied; also the effect of various processes in the production and handling of milk on its marketability aside from sanitary features. Such studies include the viscosity of cream and the effect of various metals in causing electrolytic action in milk which impairs its flavor.

Change in Language

The language of this item has been amended by inserting after the word factories, "including not to exceed \$10,000 for dairy investigations in co-operation with the Missouri Agricultural Experiment Stations, and including not to exceed \$11,000 for the purchase of additional land for experimental purposes adjoining the experimental farm of the Department of Agriculture near Beltsville, Md."

This change in language is to authorize the Department (a) to cooperate with the Missouri Agricultural Experiment Station in developing a dairy experimental station on the Hatch farm, near Hannibal, Missouri, and (b) to purchase for experimental purposes approximately 80 acres of land, now under lease, which adjoins the Beltsville, Md., dairy farm on the south.



BUREAU OF DAIRY INDUSTRY (Continued)(c) FIELD STATION, WOODWARD, OKLAHOMA.

Appropriation, 1930\$12,300
 Budget, 1931 12,300

Project Statement

Project	<u>Expended</u> 1929	<u>Estimated</u> 1930	<u>Estimated</u> 1931
Field Station, Woodward, Oklahoma	\$12,296	\$12,300	\$12,300

Activities under this AppropriationGeneral

This station is located in the central great-plains area. A herd of purebred Holstein-Friesian cattle is maintained for investigational purposes. These investigations include both dairy cattle breeding, and feeding and management.

Breeding: The breeding work involves the breeding of a pure line for high production by the continued use, for generation after generation, of sires that have proved their ability to transmit uniformly high production. Young purebred sires are placed with farmers in the vicinity of the station under cooperative agreement to be proved as to their capacity for transmitting high milk and butterfat production.

Feeding and management: The feeding and management work includes pasture experiments to determine the most profitable pasture practices for this locality with various tame grasses, the effect of winter grazing on grain yield of wheat, comparative value for milk production of crops cut at different stages of maturity, comparison of the losses in nutrients of silage in a trench silo with such losses in upright hollow tile silo, and methods and cost of growing heifers.

(d) DAIRY AND LIVESTOCK EXPERIMENT STATION,
LEWISBURG, TENNESSEE.

Appropriation, 1930.....\$50,000
 Budget, 1931..... 20,000
 Decrease..... 30,000

Project Statement

Project	<u>Expended</u> 1929	<u>Estimated</u> 1930	<u>Estimated</u> 1931	<u>Decrease</u>
Dairy and Livestock Experiment Station, Lewisburg, Tenn.....	\$50,000	\$20,000	\$30,000

BUREAU OF DAIRY INDUSTRY (Continued)

During the fiscal year 1930, approximately \$30,000 of the \$50,000 appropriated for the Tennessee station, is being used to construct barns, sheds, silos and milk house; to remodel houses at the station for use as superintendent's house and office; and to install water, sewer and electric systems; and \$9,000 to purchase cattle. It is anticipated that this work will be well along by spring of 1930, a superintendent appointed, the animals which are being bought and held at the Beltsville station moved in, and the experimental work begun. The \$20,000 submitted is for operation of the station during 1931.

Activities under this Appropriation.

The work at this station will be a demonstration of modern dairy practices applicable to the bluegrass regions of the Southern states. Investigational work to be conducted will include factors affecting the carrying capacity of bluegrass pastures through the frequent rotation of dairy animals between various pasture plots and the comparative effects of top dressing such plots with limestone, phosphate, and nitrates; the best feed crops for both roughage and grain that may be grown under the local climatic conditions for feeding dairy cattle, and the methods of harvesting, storing, and preserving such crops in order to secure the most economical and profitable productions. Investigations in dairy-cattle breeding and dairy products manufacture will also be conducted, the former involving the breeding of strains of cattle that will be pure in their inheritance for a high level of producing capacity through the continued use for generation after generation of sires of known hereditary make-up; and the latter a determination of the control factors which influence coagulation and evaporated milk in sterilization and the relationship of the feeding and care of dairy cows to such factors.

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Note: - Also see Miscellaneous Section for both "Experiments in Dairying and Livestock Production in Western United States" and "Agricultural Investigations in Cooperation with South Carolina Experiment Station."

BUREAU OF PLANT INDUSTRY

The Bureau of Plant Industry is primarily a research organization devoted to the investigation of problems of plant production. Its general objective is the reduction of the heavy waste of human energy, time, and money resulting from lack of knowledge of the essential biological facts and processes involved in plant growth and plant utilization. This work includes crop improvement by breeding and selection; the introduction of new crops by means of seeds and plants procured through foreign exploration; experimentation in methods of culture and rotation systems adapted to irrigation, dry-land, and other systems of agriculture; investigations in handling, storing, shipping, processing, or otherwise utilizing plants or plant products; and diagnosis and control of the many kinds of plant diseases. The solution of such problems involves widely varied agronomic, horticultural, physiological, biochemical, and technological research in laboratory and field, often including the continuance of particular experiments for extended periods of years, to determine the essential facts upon which to base sound practice.

(a) GENERAL ADMINISTRATIVE EXPENSES

Appropriation, 1930 \$ 207,000
 Budget, 1931 207,000

Project Statement

<u>Project</u>	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>
General Administration	\$206,289	\$ 207,000	\$ 207,000

Activities under this Appropriation

The direction of the work of the Bureau of Plant Industry, the administration of its fiscal affairs, the general supervision of personnel, the administrative review and editing research publications for printing, and bibliographical and related library work.

(b) MYCOLOGY AND DISEASE SURVEY

Appropriation, 1930 \$ 58,500
 Budget, 1931 59,500
 Increase 1,000

The increase of \$1,000 is submitted for the following purpose:

(1) \$1,000 for 4 months special plant disease survey work in Georgia in cooperation with the State. Similar surveys have been conducted in Missouri, Iowa, Utah, West Virginia, and Montana and it is desired to extend this activity to other States.

BUREAU OF PLANT INDUSTRY (Continued)Project Statement

<u>Project</u>	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>	<u>Increase</u>
Disease Survey	\$ 29,980	\$ 29,872	\$ 30,872	\$1,000 (1)
Mycology	21,799	22,628	22,628	-
Mushroom diseases	5,032	6,000	6,000	-
	<hr/> \$ 56,811	<hr/> 58,500	<hr/> 59,500	<hr/> 1,000

Activities under this AppropriationGeneral

Surveys are made to determine the geographic distribution, prevalence, and rate of spread of plant diseases in the United States and losses caused by disease, as well as the appearance of new or dangerous diseases and epidemics or unusual outbreaks of disease. Specimens of all plant parasites and other fungi having relation to injury or destruction of economic plants and plant products are collected, identified, and preserved for technical study and reference purposes.

Disease Survey. The Disease Survey conducts an information service on diseases of plants. The information secured is of exceptional importance in carrying forward investigation and control programs of diseases both by the Department of Agriculture and the State Agricultural Experiment Stations. Through its corps of voluntary reporters the Survey watches for new and dangerous foreign diseases which may be introduced. The first line of defense against foreign diseases is usually considered to be the quarantine and inspection service. The second line of defense is adequate surveys to discover newly introduced diseases and pests as soon as they appear.

Mycology. The project includes the work of identifying the parasitic and other fungi received from the pathological offices of the Bureau and the State Experiment Stations and from various correspondents, also the preparation of monographs of various groups, and the maintaining of a general mycological index. It involves the care of the pathological material and specimens of fungi of the Bureau, now numbering over 200,000; also labelling, sorting, classifying, and inserting new material to the extent of 12,000 to 15,000 specimens annually; periodical fumigation of all herbarium cases; withdrawal of material for use, and its proper

BUREAU OF PLANT INDUSTRY (Continued)

replacement; maintenance of a mycological exchange, with Experiment Stations and foreign institutions, the specimens now available for the purpose numbering nearly 25,000; care of the fungus section of the American Type Culture Collection; supervision and care of the Lloyd Mycological Collection on behalf of the Smithsonian Institution, this latter collection containing 60,000 specimens, 10,000 negatives of fungus subjects, and a wealth of other mycological and pathological materials. We have now one of the largest and most valuable collections in this country.

Mushroom Diseases. The work on mushrooms consists primarily of investigations of the diseases attacking the cultivated mushroom. Mycogone and "plaster mold" are the two outstanding diseases demanding attention at this time. A new control measure for Mycogone which involves only a slight change in cultural practice without additional expense to the grower has been devised. A new disease of a distinct type has appeared in a number of localities, and is being carefully studied. Attention is being given to other problems of the industry, as time permits, including spawn-making, classification of varieties, possible manure substitutes, minor diseases and cultural practices.

(c) CITRUS CANKER ERADICATION

Appropriation, 1930 \$45,000
Budget, 1931 45,000

Project Statement

<u>Project</u>	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>
Citrus Canker Eradication	\$ 44,801	\$ 45,000	\$ 45,000

Activities under this AppropriationGeneral

The Bureau of Plant Industry, in cooperation with Florida, Alabama, Mississippi, Louisiana and Texas is conducting a campaign for the eradication of citrus canker, a bacterial disease of citrus fruits and trees, by the thorough inspection of nurseries and citrus groves, formalin treatment of infected soil, protective spraying of groves exposed to infection, and destruction of diseased trees. As a result of the vigorous campaign, the

BUREAU OF PLANT INDUSTRY (Continued)

disease has been practically eliminated, but scattered inflections still occur sporadically.

During the past year sixty-five inspectors were used in this work and this force inspected approximately eleven million grove trees and over eighty million nursery trees. For the fiscal year 1930, the States expect to contribute \$194,555 to the cooperative campaign for eradication of this disease.

1. Florida. Out of 515 properties which have been found infected at various times, two properties are now under suspicion because they were found heavily infected in November, 1927, and it was necessary to destroy approximately 200 grove trees to prevent a spread of the disease.

2. Alabama. It is now believed that Alabama is free from citrus canker as it has not reported an infection for two years but in order to prevent a recurrence of the disease, a close reinspection of all nurseries and properties in this State is being made.

3. Mississippi. This State has not reported an infection of citrus canker since 1922 and it is believed that Mississippi is free from this disease.

4. Louisiana. In Louisiana during the past year it was necessary to destroy 36,166 grove and nursery trees scattered throughout nine parishes in the state. It is estimated that it will take at least three years to completely eradicate citrus canker from Louisiana.

5. Texas. The last infection reported from Texas was in February, 1929 when two trees were found infected which made it necessary to destroy all trees adjacent to the infected ones.

Due to these scattered infections it will be necessary to maintain a systematic inspection of the entire Southern citrus area for several years.

(d) FOREST PATHOLOGYChange in Language

The immediately available provision which appeared in the 1930 Act is omitted.

Appropriation, 1930:

Facial	\$195,052
Less \$5,000 expended in	
1929 of \$10,000 made	
immediately available for	
Larch Canker	- 5,000
Total available, 1930	190,052
Budget, 1931	210,000
Actual increase	19,948
(Apparent increase	14,948)

BUREAU OF PLANT INDUSTRY (Continued)

The increase of \$19,948 is submitted for the following purposes:

(1) \$10,000 for pathological investigations at the Allegheny Forest Experiment Station in cooperation with Forest Service and serving New Jersey, Pennsylvania, Delaware, and Maryland. Root diseases that slow down growth and decay fungi that destroy timber already grown appear to be important factors in the low timber yield of much of this region. The proposed investigation of both these types of disease is part of the program authorized by the McSweeney-McNary Act. No intensive studies of native forest diseases have ever been made in the states named.

(2) \$9,948 for cooperation with the National Park Service in investigating diseases of trees of the National Parks. A survey covering all the Parks is a first need, both of native diseases and to ascertain whether imported diseases of epidemic nature are present. Immediate investigation is required of three bark diseases attacking firs in Glacier National Park, and to devise methods of avoiding the pathological effects that are resulting from concentration of tourist travel in the giant Sequoias, and near camps in Yosemite and other Parks.

Project Statement

<u>Project</u>	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>	<u>Increase</u>
Diseases of Forest Trees and Forest Products	\$101,000	\$ 132,080*	\$ 142,080	\$10,000 (1)
Diseases of Shade Trees, Shrubs, and Chestnut Orchards	<u>58,657</u>	<u>57,972</u>	<u>67,920</u>	<u>9,948</u> (2)
Total	\$159,657	\$190,052	\$210,000	\$19,948

*The Agricultural Appropriation Act for 1930 carried an increase of \$35,000 for the investigation of European Larch Canker, \$10,000 of which was immediately available, but \$5,000 only of this was expended in 1929, leaving the amount available for this project in 1930, \$132,080.

Activities under this AppropriationGeneral

The diseases of forest and shade trees and shrubs, including white pine blister rust, chestnut blight, heart-rot of Douglas fir, European larch

BUREAU OF PLANT INDUSTRY (Continued)

canker, and many other diseases, are investigated with a view to determining methods of control. The research work on forest pathology authorized by the McNary-McSweeney Act is conducted under the appropriation.

DISEASES OF FOREST TREES AND FOREST PRODUCTS

Native Diseases of Forest Trees. Under this sub-project are studied the native diseases that attack leaves, branches, bark, or roots, or decay the wood of standing trees in the forest. In many stands it has been found that diseases of one or more of these types have so decreased timber yield as to make forestry unprofitable. The causal organisms, their effect on the individual tree and on the stand as a whole, and their relation to forest conditions and practices are investigated. For the diseases that have been most studied practicable modifications in forest management methods have been worked out looking toward their prevention in young stand and minimizing their effect in stands already diseased. The work is carried on in close cooperation with foresters, and in the past has been mainly done on the National Forests of the Pacific Coast and Southwest, which make up a relatively small portion of the total forest area of the country. Studies have now been begun on non-government forest land in the Pacific Northwest, and on a small scale at three of the eastern Forest Experiment Stations.

Diseases of Forest Products. Under this sub-project are studied the discolorations and decays of logs, timbers, lumber, pulp, paper, and of wood in construction. Discolorations due to fungi have been separated from those due to other factors, and the different straining fungi are being critically studied. Progress has been made in the prevention of the fungus-induced stains in wood and of both discoloration and decay in pulp, by direct treatment with fungicides. Temperature and moisture conditions influencing decay are studied. The effect of a few representative wood fungi on strength of wood has been cooperatively determined and educative work has been done to promote the utilization of wood that has been infected with fungi that do not seriously affect strength.

Chestnut Blight (Forest) The two divisions of this problem are, first, pathological studies in connection with the salvage of timber on 33 million acres of chestnut growth in the southern Appalachians, and, second, the reestablishment of the chestnut as a forest tree. The work includes surveys to determine the annual distribution of the blight and its rate of spread as an aid to the marketing of the timber stands; studies on the tannin value of dead trees; studies on resistant trees, sprouts, and seedlings as a means of reestablishing the American chestnut as a forest tree; and an expedition into Asia to secure seed of the best forest types of the chestnut from all important regions of Japan and Korea. Resistant Varieties, some of which will undoubtedly prove to be suitable for this country, have been located and are being brought to this country for test plantings. Surveys and reports from many cooperators indicate that the chestnut blight is continuing its steady spread throughout the southern Appalachians.



BUREAU OF PLANT INDUSTRY (Continued)

Blister Rust Research. Methods are investigated of distinguishing white pine blister rust from the unimportant native rusts in the stages on currants and gooseberries; to enable the eradication crews to avoid confusion. Search is made for cultural varieties of currants that do not carry the rust and can, therefore, be planted without endangering pine; highly resistant varieties had been found in previous years, and a variety recently found shows a complete immunity in preliminary tests.

European Larch Canker. The main problem is the detection and eradication of the introduced canker fungus which has attacked conifers in the Northeast. The research required consists not only of hunting for infections but of carefully studying the fungus and its work, and studying in comparison with similar but unimportant native fungi from which it is difficult to distinguish the foreign fungus in the early stages of an infection. While differences between strains of the foreign fungus have confused the situation, the strongly parasitic character of the organism attacking larch has been established, and all of the cankers detected to date on the larch itself have been eradicated. To date the disease, fortunately, has been found in relatively few places in New England and restricted in distribution in those localities.

Douglas Fir Canker. This serious European disease has been studied in Europe to learn whether it constitutes a menace to our Douglas fir forests, and by what means the danger of its establishment in this country can be lessened. The cause has been determined and the causal organism found to differ from any now known in the United States.

Woodgate Rust. Field reconnoissance of Woodgate rust, a disease of unknown origin, has been continued in so far as practicable in connection with other work, and the disease has been found on Scotch pine at points in New York and eastern Canada, where it has done great damage to certain early infected plantings.

Laboratory studies have been conducted which establish that, at least under certain conditions, slash pine, loblolly pine, and western yellow pine can be infected with this disease.

BUREAU OF PLANT INDUSTRY (Continued)DISEASES OF SHADE TREES, SHRUBS, AND CHESTNUT ORCHARDS

Diseases of Shade Trees. Under this sub-project the diseases of shade and ornamental trees and shrubs are investigated. Methods of tree repair are studied experimentally. The relation of soil conditions and soil treatments to disease are studied. The different stem diseases of roses have been particularly investigated, including a study of a recently introduced canker fungus. The work in tree surgery has included the development of the wood-block method for filling cavities and the determination that pruning wounds heal better if made just at the beginning of growth than if made during fall or winter.

Diseases of Chestnut Orchards. The main problem is the reestablishment of the chestnut as an orchard and ornamental tree in the eastern United States. The more important phases of this problem are the locating and testing of native and introduced trees which have survived the blight, hybridization studies to combine blight resistance with desirable horticultural and ornamental characteristics, and the introduction and testing of species and varieties of chestnuts from Asia.

(e) BLISTER RUST CONTROL

Appropriation, 1930 \$454,700
 Budget, 1931 454,700

Project Statement

<u>Project</u>	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>
Eastern Control	\$206,626	\$ 220,092	\$ 220,092
Western Control	241,411	234,608	234,608
Total	<u>\$448,037</u>	<u>\$ 454,700</u>	<u>\$454,700</u>

BUREAU OF PLANT INDUSTRY (Continued)Activities under this AppropriationGeneral

Campaigns are conducted for the suppression and control of white pine blister rust by cooperating with State organizations, counties, towns and individual land owners in the eradication of Ribes which serve as carriers of the disease, inspection of nursery stock likely to carry the disease to uninfected regions, and other control methods. The Eastern and Lake States cooperating are Connecticut, Maine, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont and Wisconsin. The Western States cooperating are California, Idaho, Montana, Oregon, and Washington.

During the past year the rust spread into the main commercial western white pine areas of Idaho and Montana, and further intensified in Washington and Oregon. It is also present near the northern range of the sugar pine belt and may within the next few years reach the main sugar pine areas of California. This Bureau is cooperating with the Forest Service and the States concerned in the systematic eradication of the stream-type Ribes, which are highly susceptible, as a necessary measure to avert heavy immediate losses to the pine. Following this work, systematic control will need to be extended over the remaining area as rapidly as practicable. An outstanding feature of the work in the Western States during the last two seasons has been the successful development of chemical eradication of Ribes on stream-type areas.

In New England and New York blister rust is steadily increasing in the unprotected areas. However, in these States the situation is well in hand, the pine areas are being successfully protected by systematic Ribes eradication on more than 800,000 acres annually, and there is every assurance that control can be maintained at low cost.

In Michigan, Wisconsin, Minnesota, and Pennsylvania the disease is spreading much more rapidly than heretofore.

During the fiscal year 1930 the Eastern and Lake States will contribute \$229,150 and the Western States, \$88,350 to the cooperative eradication campaign.

BUREAU OF PLANT INDUSTRY (Continued)(f) PLANT NUTRITION

Appropriation, 1930.....\$17,990

Budget, 1931..... 17,990

Project Statement

<u>Project</u>	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>
Plant Nutrition Investigations.	\$17,442	\$17,990	\$17,990

Activities under this AppropriationGeneral

Plant nutrition investigations deal with the effect of length of day on growth, development and composition of plants; the influence of certain crops on other crops following in the rotation; the plant-food elements and the relative plant-food requirements of crops commonly grown in rotation. The work is carried on with the same personnel as Tobacco investigations.

The principal activity consists of studies on the effect of light and crop rotation. Field, greenhouse and laboratory experiments in growing plants under regulated conditions of light are conducted. This work is carried out mainly in Washington and at Arlington Farm, Virginia. The studies include effects of the daily duration, the intensity and color or composition of the light. Recent investigations have shown that both plant and animal life are profoundly affected by light in ways not previously suspected. The normal growth and development of plants, their composition and their value as food or feed are conditioned largely on the composition and distribution of the sunlight received by them. It is now known that the change in length of day with season and with latitude is a leading factor in determining both the date and the amount of flowering and fruiting in any particular latitude as well as the changes in behavior of crop plants in this respect when carried from one latitude to another. The effects of crop plants on the growth of succeeding crops in the rotation and the relation of the plant food supply to these effects are extensively studied by means of field plot tests.

(g) COTTON PRODUCTION AND DISEASES.

Appropriation, 1930	\$140,500
Budget, 1931.	<u>200,000</u>
Increase.	59,500

The increase of \$59,500 is submitted for the following purposes:

(1) \$15,000 for adaptation and breeding of varieties in the East.

This is desired for breeding and cultural work in the Eastern Cotton Belt to improve the staple, comparable to what has been done in the past in Texas and the Southwestern States. A crisis is impending in the production of cotton in the Mississippi Valley and the Southeastern States on account of the greatly increased production of short staple cotton in northwestern Texas and adjacent plateau regions which are not affected by the boll-weevil. There is a special need at the present time to improve the quality of our cotton crop to meet the rapidly increasing competition of foreign countries, both in production and in manufacturing:

(2) \$20,000 for special investigations of Sea Island cotton. Investigations of this type of cotton have been started in South Carolina at the request of the Cotton Manufacturers' Association and in cooperation with former producers, as this is a type of cotton that is needed for the manufacture of fine fabrics, such as airplane cloth, thread, etc. The work has been well begun so that by 1931 we should have available a sufficient supply of high-grade Sea Island seed to make possible increased plantings on the Sea Islands and in favorable localities in the coast districts of South Carolina, Georgia, and Florida:

(3) \$15,000 for developing stocks of pure seed in one-variety cotton communities in the East. The one-variety system of production based on pure seed supplies has been developed and demonstrated in the Southwestern States and is applicable to the whole Cotton Belt. The development and maintenance of basic seed stocks and cooperation with State and local leaders in establishing one-variety conditions of production are the general requirements to be met. With the development of the one-variety community production of superior varieties of cotton, it is possible to change the basis of production from the usual condition of mixed and mongrelized seed-stocks to regular supplies of pure seed, so that without extra cost all farmers of the community can produce fiber of the same character, thus opening the way for a full utilization of improved varieties and methods and for working out better market relations than are now possible.

(4) \$9,500 for cotton root rot investigations. Investigations of this very destructive disease are being conducted in Texas and neighboring States, as well as in Arizona and California, in cooperation with the Bureau of Chemistry and Soils of this Department and with the State workers in the States concerned. Marked progress has been made recently in determining the habits of the fungus that causes this disease and the work has now reached the stage of testing in the field several new possibilities of controlling the disease, which the experiments indicate may be of value and may lead to practical solutions of the root rot problems.



BUREAU OF PLANT INDUSTRY (Continued)Project Statement.

<u>Project</u>	<u>Expended,</u> <u>1929</u>	<u>Estimated,</u> <u>1930</u>	<u>Estimated,</u> <u>1931</u>	<u>Increase</u>
Acclimatization, breeding and cultural improvement of cotton.	\$78,939	\$79,827	\$129,827	\$50,000(1-2-3
Egyptian cotton breeding.	23,899	24,640	24,640	- - -
Cotton diseases	27,079	36,033	45,533	9,500 (4)
	<u>\$129,917</u>	<u>\$140,500</u>	<u>\$200,000</u>	<u>\$59,500</u>

Activities under this AppropriationGeneral

The work is carried on in the Southern and Southwestern United States and includes the acclimatization and adaptation of cotton introduced from tropical regions, the breeding of superior varieties of cotton, the improvement in methods of cotton culture under boll-weevil conditions, and the investigation and control of cotton diseases.

Acclimatization, breeding and cultural improvement of cotton.

1. Adaptation and breeding of superior varieties. These investigations include the breeding of new and desirable types of cotton; the modification and improvement of cultural methods and the maintenance of stocks of pure seed and the testing and local adjustment of varieties in regions where they are of most value.

Field stations which serve as headquarters for the investigation of cotton varieties with especial reference to improvement of general cultural methods and the breeding and establishment of adequate supplies of seed of pure varieties are maintained at James Island, S.C., Greenville, Tex., Shafter, Calif., College Station, N. M., and Sacaton, Ariz.

As a result of these studies, superior varieties of cotton have been bred, while others have been discovered and introduced from abroad and developed in this country.

The methods of growing cotton have been revolutionized by the new methods of close spacing based on the botanical discovery that the cotton plant has two distinct kinds of branches.

BUREAU OF PLANT INDUSTRY (Continued)

2. Sea Island cotton investigations. Production of Sea Island cotton was abandoned during the war and manufacturers of sewing threads, balloon cloth and airplane cloth have been utilizing various substitutes for Sea Island cotton. For these purposes, however, other types of cotton are less satisfactory. Preliminary experiments are now under way with the expectation of securing a supply of high-grade seed for planting in favorable localities to determine the practical possibilities of new methods of growing this cotton.
3. One variety production. In accordance with the advice and field assistance of the Bureau, the basis of production in the cotton industry is being changed gradually from inferior mixed seed to uniform pure-bred seed-stocks, so that the fiber is more uniform in the field. The change is brought about by establishing the production of a single variety in an organized community, which makes it possible for the community seed-stocks to be kept pure and all of the farmers of the community supplied with the same seed. Better opportunity for establishing market contacts is also provided by the single variety form of community organization.

Egyptian cotton breeding. This project involves selection and hybridization of strains of Egyptian cotton through the ordinary methods of plant breeding, testing the most promising strains on a field basis, and distribution to farmers of the variety which yields best and of which the fiber gives best results in spinning tests. The behavior of Egyptian cotton on soils having different salt content and moisture conditions is also studied to ascertain the soils best adapted to the Egyptian cotton crop. The Pima variety, developed by the Bureau, is grown extensively in the Salt River Valley of Arizona.

Cotton diseases. Investigations of the root-rot disease, inaugurated in 1929, are going forward in Texas and neighboring States, in cooperation with other Bureaus of this Department and with State workers. Marked progress has been made in determining the habits of the fungus causing the disease, and the work has now reached the stage of testing in the field several new possibilities of control.

On the basis of an increase provided in the 1930 appropriation for cotton disease work, the study of wilt and other cotton diseases prevalent in the southeastern United States is being resumed and pushed forward, especially from the standpoint of longer staple cotton in the humid districts.

BUREAU OF PLANT INDUSTRY (Continued)(h) RUBBER, FIBER AND OTHER TROPICAL PLANTS

Appropriation, 1930 \$160,000
 Budget, 1931 \$160,000

Project Statement

<u>Project</u>	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>
Acclimatization and adaptation of crops from tropical regions	\$ 46,387	\$ 47,965	\$ 47,965
Rubber production investigations	101,316	77,877	77,877
Fiber investigations	<u>29,825</u>	<u>34,158</u>	<u>34,158</u>
Totals	\$ 177,528	\$ 160,000	\$ 160,000

Activities Under This AppropriationGeneral

The work under this item is directed chiefly to acclimatization and adaptation in the Southern and Southwestern United States of varieties of corn and other crop plants of tropical origin; the investigation of rubber producing possibilities in the United States, Philippine Islands, West Indies, Canal Zone, and elsewhere in tropical America; and investigation of hard fiber production in the Philippine Islands, Porto Rico, and Canal Zone; and work with flax and hemp within the United States.

Acclimatization and adaptation of crops from tropical regions.

These investigations include the study of the adaptations and other special characters and uses of the economic plants indigenous in tropical America or in other countries; the effects of new and changed conditions on the varieties; the development of superior strains by selection or hybridization; the study and improvement of methods of production; and utilization of any new types of plants that can be adapted to our conditions. Superior varieties of tropical crop plants, including coffee, cacao, bananas, coconuts, and other economic palms, are being studied to determine their possibilities of acclimatization and adaptation to conditions found in the United States or our insular possessions.

Rubber production investigations. Rubber is obtainable from many species of plants, belonging to different families and adapted to different conditions, not only in the humid tropics but in temperate or dry regions.

Experiments are being made with Hevea and other tropical rubber plants in southern Florida, Haiti, and the Canal Zone, to determine the range of adaptation of the different species. Conditions of production in tropical America are different from those in the East Indies, so that

BUREAU OF PLANT INDUSTRY (Continued)

there is little prospect of producing rubber on the same basis as in the East Indies, with regular supplies of Oriental contract labor. But other systems of production are possible that may enable the raw rubber to be placed upon the American market in competition with the East Indian product. This problem is now being investigated.

Experimental tapping of 20-year old trees in Haiti show yields like those of the East Indian plantations, outside of the equatorial belt to which the Hevea tree was supposed to be confined.

Fiber investigations. The following lines of work are conducted under this project:

1. Hemp investigations, the object of which are
 - a. Maintain standard strains and develop better types to give larger yields and more uniform fiber;
 - b. Develop earlier varieties to lengthen the harvesting period and also permit earlier retting;
 - c. Develop more efficient scutching machines for the preparation of the fiber;
 - d. Develop a more stable supply of seed for sowing;
 - e. Develop more satisfactory conditions for marketing hemp fiber.

2. Fiber flax investigations, the objects of which are
 - a. Develop strains of fiber flax adapted to conditions in this country and thus avoid the necessity of importing seed of uncertain type with the attendant danger of importing flax diseases;
 - b. Determine how American strains of fiber flax compare with fiber flax from seed of commercial fiber flax from Europe or with improved varieties developed by plant breeding at European stations;
 - c. Determine the adaptability of fiber flax in different soils;
 - d. Determine the adaptability of fiber flax in the South Atlantic States.

3. Hard fiber investigations, including abaca (Manila hemp) and maguey cultivated in the Phillippine Islands; henequen cultivated in Yucatan and Cuba, and sisal cultivated in East Africa, Java, and Sumatra.
 The lines of investigation are
 - a. Maintaining standards of abaca;
 - b. Developing machine cleaning methods;
 - c. Introduction of abaca into the American tropics;
 - d. Encouragement of maguey fiber production;
 - e. Developing better strains of henequen and sisal;
 - f. Developing a cleaning machine for preparing the fiber of henequen, sisal and abaca.

BUREAU OF PLANT INDUSTRY (Continued)(i) DRUG AND RELATED PLANTS

Appropriation, 1930.....\$37,700

Budget, 1931 37,700

Project Statement

<u>Project</u>	<u>Expended,</u> <u>1929</u>	<u>Estimated,</u> <u>1930</u>	<u>Estimated,</u> <u>1931</u>
Drug and Related Plants.....	\$34,725	\$37,700	\$37,700

Activities under this AppropriationGeneral

Scientific studies are made on the growing of drug, essential oil and drying oil crops, and the preparation of commercial products therefrom. Botanical surveys are made on grazing areas where poisonous plants cause losses of livestock.

1. Drug Plants:

- a. Determining the cultural requirements of important drug plants and the quality and quantity of the products produced therefrom under domestic culture.
- b. Investigating the commercial growing of drug plants as farm crops.
- c. Laboratory studies on the constituents of drug plants.

2. Poisonous Plants:

- a. Botanical survey of some of the principal grazing areas and Forest Reserves to determine the distribution and abundance of plants poisonous to stock.
- b. Chemical and physiological studies of poisonous plants.

3. Essential Oil Plants:

- a. Investigations on the chemical composition of essential oils with special reference to the relationship of quality to methods of production and geographic sources.

1. The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that proper record-keeping is essential for the transparency and accountability of the organization. This section also outlines the various methods used to collect and analyze data, ensuring that the information is reliable and up-to-date.

2. The second part of the document focuses on the financial aspects of the organization. It provides a detailed overview of the budget, including the projected income and expenses for the upcoming year. This section also discusses the various financial risks and how they can be mitigated, ensuring that the organization remains financially stable and secure.

3. The third part of the document addresses the human resources of the organization. It discusses the current state of the workforce, including the number of employees, their skills, and their experience. This section also outlines the various strategies used to attract and retain talent, ensuring that the organization has a strong and capable workforce.

4. The fourth part of the document discusses the marketing and sales efforts of the organization. It provides a detailed overview of the various marketing campaigns and sales strategies used to promote the organization's products and services. This section also discusses the various challenges faced in the marketing and sales process and how they can be overcome.

5. The fifth part of the document discusses the overall performance of the organization. It provides a detailed overview of the various key performance indicators (KPIs) used to measure the organization's success. This section also discusses the various factors that have contributed to the organization's success and how they can be leveraged to achieve even greater success in the future.

BUREAU OF PLANT INDUSTRY (Continued)

- b. Field tests with essential oil plants to determine the crop possibilities of such plants in regions where economic conditions are favorable.
 - c. Collection of data on established essential oil crops in the United States.
4. Oil-Seed Crops:
- a. The introduction of oil-seed crops for the production of drying oils, the present domestic supply of which is far below the needs of the industries.
 - b. Technological studies on the utilization of such oils in the industries.
5. Medicinal Plant Survey:
- a. To determine the distribution of valuable medicinal plants and to locate the regions in which they may be obtained in quantity in case of emergency.
6. Waste Products Utilization: The work consists of investigations to find means of utilizing commercially various waste products such as cedar sawdust for production of cedar oil; and waste from hop-picking machines for production of hop oil.

(j) NEMATOTOLOGY

Appropriation, 1930 \$57,900
 Budget, 1931. 57,900

Project Statement

<u>Project</u>	<u>Expended,</u> <u>1929</u>	<u>Estimated,</u> <u>1930</u>	<u>Estimated,</u> <u>1931</u>
Investigations in nematology	\$57,051	\$57,900	\$57,900

Activities under this AppropriationGeneral

These investigations deal primarily with the study of minute eelworms or nemas, certain species of which infest important crop plants and seriously injure them. Some species of nemas are found to be beneficial, destroying insects or other species of injurious nemas.

- 1. A study of the nature, distribution and treatment of the diseases caused by root-infesting nemas and studies concerning their structure and

BUREAU OF PLANT INDUSTRY (Continued)

life history.

Special attention has been devoted to methods of control by rotation or other cultural practices and informal cooperation is maintained with nursery inspectors through the spread of the nema by shipment of infested plants.

2. Study of the Mermithidae, a large and important group of nemas infesting insects mainly. These studies have resulted in the discovery of about 300 new species -- five times as many as were hitherto known.

Of these the cucumber beetle nema, the northern grasshopper threadworm, the southern grasshopper threadworm and the mosquito and gnat nemas have been found to be of considerable economic importance in controlling outbreaks of these insects.

(k) SEED LABORATORY

Appropriation, 1930.....\$77,800
Budget, 1931..... 77,800

Project Statement

<u>Project</u>	<u>Expended,</u> <u>1929</u>	<u>Estimated,</u> <u>1930</u>	<u>Estimated,</u> <u>1931</u>
Seed Testing.....	\$44,749	\$46,696	\$46,696
Federal Seed Act....	<u>28,490</u>	<u>31,104</u>	<u>31,104</u>
Total.....	73,239	77,800	77,800

Activities under this AppropriationGeneral

Advisory service is maintained for farmers, seedsmen, and others interested in seed quality, based upon seed samples tested to determine the proportion of pure seeds present, the kind and proportion of weed seeds, and the germination of the pure seed. Investigation is made of factors essential in seed quality and their relation to the technique of seed testing, such as the significance of seeds of weak germination to crop production.

This appropriation also provides for the enforcement of the Federal Seed Act, (U.S.C. P.95, secs. 111-114) which requires the sampling of all shipments of field seeds, the coloring of red clover or alfalfa seed of foreign origin, and regardless of origin establishes penalties on misbranding and adulteration of seed in interstate commerce. Laboratories are located

BUREAU OF PLANT INDUSTRY (Continued)

at the following points: Washington, D.C., which is the main laboratory of the office, and cooperative seed testing laboratories located at Sacramento, California; Lafayette, Indiana; Columbia, Missouri; and Corvallis, Oregon.

1. Seed Testing.

- a. Seed Testing Research. Classification and description of seeds difficult of recognition makes possible determination of trueness to kind, variety and type of seeds of important and closely related cultivated crops, and identity of troublesome and noxious weeds.

Knowledge of incidental seeds in imported and domestic seeds, gained from study of seeds passing in commerce over a long period of years, makes possible the determination of area of production.

Studies of the development and morphology of seeds and of the physiology and chemistry of germinating seeds indicate the methods best adapted for the germination of difficult groups of seeds - Bluegrasses, frosted cereals, Texas cotton.

- b. Service. At the Washington and branch laboratories, seeds of all kinds are tested for the general public to determine mechanical purity; freedom from weed seeds and adulterants and live pure seed content and informational reports made to those submitting samples for test.
- c. Adulterated Seed Investigations. Seeds are purchased as by farmers and tested for adulteration and misbranding. Publication of results of tests together with names of persons selling adulterated and misbranded seeds has contributed largely to check abuses in the commerce in agricultural seeds.

2. Federal Seed Act.

All importations of seeds subject to the Federal Seed Act are sampled by the U. S. Customs Service. All samples are examined to determine compliance with the requirements of the Federal Seed Act.

Over 450,000,000 pounds of imported forage plant seeds have been permitted entry into the United States after examination during the ten years ending June 30, 1929.

The Federal Seed Act, as amended, requires the coloring for identification of definite proportions of the seed in each sack of alfalfa and red clover imported.

The coloring of 1,146,400 pounds of alfalfa and of 7,547,000 pounds of red clover seed was personally supervised during the importing season of 1928-29.

BUREAU OF PLANT INDUSTRY (Continued)

Section 6 of the Federal Seed Act, prohibiting interstate shipment of misbranded seed has been invoked in the cases of

Cotton seed not true to variety.
 Rye seed not true to variety.
 Alfalfa seed misbranded as to origin.
 Red clover " " " " "
 Oat " " " " quality.
 Soybean " " " " germination.

Part of these cases have been disposed of by returning the seed to the shipper under bond to be disposed of in compliance with state and federal law, as provided by the Federal Seed Act, part by destruction and part are still pending.

(1) CEREAL CROPS AND DISEASESChange in Language

The language of this paragraph has been amended by eliminating the following: "including barberry eradication," and

"Provided, That \$379,920 shall be set aside for the location of and destruction of the barberry bushes and other vegetation from which rust spores originate: Provided further, That \$75,000 of this amount shall be available for expenditure only when an equal amount shall have been appropriated, subscribed, or contributed by States, counties, or local authorities, or by individuals or organizations, for the accomplishment of such purposes."

This revision has been made because of the transfer to a separate item of the appropriation for barberry eradication heretofore carried under this item.

Appropriation, 1930

Facial	\$431,000
Balance available, 1930, for barley scab investigations provided by Second Deficiency Act, 1929,	13,396
Total available, 1930.....	444,396
Budget, 1931.....	535,000
Increase.....	90,604

The increase of \$90,604 is submitted for the following purposes:

(1) \$60,604 for western wheat investigations as follows:

- (a) \$10,000 for hard red spring wheat improvement research.
 For the fiscal year 1930, \$29,920 was appropriated for this work. The present recommendation represents an enlargement

of the north-central States (Minnesota, South Dakota, North Dakota, Montana, and Wyoming) is requesting that enlarged investigations be undertaken to determine the factors affecting quality, and the causes of resistance to cold drouth etc.

(b) \$20,302 for hard red winter wheat improvement research.

Hard red winter wheat is of major importance to the agriculture and prosperity of the central and southern States in the Great Plains Area (Nebraska, Kansas, Colorado, Oklahoma, and Texas). The farmers are suffering from reductions in quality and yield and at the same time are forced to meet largely increased production costs. Expanded research is needed on improvement for quality and yield, including disease resistance, insect resistance, winter hardiness, heat and drought tolerance, stiff straw, and seed-holding power.

(c) \$20,302 for Pacific Northwest wheat improvement research.

The most important agricultural crop in the Pacific Northwest is wheat. Problems in wheat production and handling differ from those of any other wheat-producing section in the United States, as climate, soil, cultural methods, varieties, and market demands are all different from those elsewhere in the country. Stinking smut and certain foot rots are serious problems; resistance to hail, cold, heat and drought is essential in varieties for this region which comprises Oregon, Washington, and Idaho.

(d) \$10,000 for Southwestern wheat improvement research. Both Utah and California have large dry-land areas on which wheat is the principal and sometimes the only cash crop, while Arizona plans to grow sufficient wheat for domestic consumption because of her distance from other wheat-producing areas. Dry farming under deficient rainfall and growing crops by irrigation present additional problems. Cooperation with the State agricultural experiment stations is assured in these States.

Extreme soil aridity, or, under irrigation, abundant soil moisture, correlated in both cases with low atmospheric humidity and high winter temperatures, constitute a new set of problems in wheat production for which new breeding and physiologic research must be done.

With the present difficulties facing wheat producers it is of the utmost importance that the regional studies, which have been carefully discussed and actively supported by the State Experiment Stations and Wheat Growers' Associations, be developed as rapidly as possible.

BUREAU OF PLANT INDUSTRY (Continued)(2) \$20,000 for rice investigations:

- (a) Investigations of rice in the Mississippi Valley, \$15,000.
- (b) Investigations of rice in California, \$5,000.

The State Experiment Stations of Louisiana, Texas, Arkansas, and Missouri are planning to develop enlarged research programs and have requested the cooperation of this Department in these investigations, as rice is an exceedingly important crop in these States. The increase is needed for introduction and testing of foreign varieties, breeding of improved varieties, irrigation, fertilizer, and rotation experiments, and studies on control of rice weeds and fungous diseases and the factors affecting quality in rice. The rice investigations already under way in California need enlargement for utilizing the extensive series of rices already obtained in Japan and China in breeding experiments to produce new early and productive varieties able to escape autumn rains. The rice industries in both regions have made urgent requests that the research program be enlarged to attack the many difficult problems facing them.

(3) \$10,000 for foot-rot and scab diseases of wheat, as follows:

- (a) \$5,000 for investigation of foot-rot of wheat in Montana, Wyoming, and Colorado. In 1928 a destructive outbreak of this foot-rot occurred in the Judith Basin district of Montana, as well as in sections of Wyoming and Colorado. The disease has now appeared again in the Judith Basin district of Montana and is threatening severe damage of the wheat crop. A study of this disease in Oregon is under way with funds provided by the Appropriation Act for 1930.
- (b) \$5,000 for expanding the investigations on scab disease of barley and wheat to the same disease of oats and rye. Investigations of scab of barley and wheat are being prosecuted with \$13,396 provided in a deficiency bill for the fiscal year 1930. The work needs expansion and acceleration because of its vitally important bearing on the utilization and market value of the grain. The work is correlated with the chemical and feeding studies of the Bureau of Animal Industry.

BUREAU OF PLANT INDUSTRY (Continued)Project Statement

<u>Project</u>	<u>Expended, 1929</u>	<u>Estimated, 1930</u>	<u>Estimated, 1931</u>	<u>Increase</u>
<u>Cereal agronomy:</u>				
Wheat and rye investigations...	\$ 69,330	\$ 89,225	\$149,829	\$60,604 (1)
Oat investigations.....	26,200	27,650	27,650	- - -
Barley investigations.....	26,290	26,915	26,915	- - -
Rice investigations.....	25,000	26,320	46,320	20,000 (2)
Grain sorghum investigations...	13,060	14,285	14,285	- - -
Flax investigations.....	9,800	10,040	10,040	- - -
Corn investigations.....	51,179	55,900	55,900	- - -
Total, cereal agronomy.....	<u>220,859</u>	<u>250,335</u>	<u>330,939</u>	<u>80,604</u>
<u>Cereal pathology:</u>				
Bacterial and virus disease investigations.....	21,800	27,470	27,470	- - -
Sac and imperfect fungi investigations.....	58,960	75,666	83,666	10,000 (3)
Rust investigations.....	49,435	50,425	50,425	- - -
Smut investigations.....	38,070	42,500	42,500	- - -
Total, cereal pathology....	<u>168,315</u>	<u>194,061</u>	<u>204,061</u>	<u>10,000</u>
Total, Cereal Crops and Diseases.....	<u>389,174</u>	<u>444,396</u>	<u>535,000</u>	<u>90,604</u>

Activities under this AppropriationGeneral

Cereal investigations include studies of cultural practices and investigation of their possible improvement, comparison of yield and adaptability to different regions of different varieties of cereals, together with the breeding and selection of improved and better adapted varieties, and development of methods of control of the diseases of all cereal crops.

The lines of work carried on under this appropriation consist of two general classes, namely, Cereal Agronomy and Cereal Pathology, with the particular activities listed under each.

CEREAL AGRONOMYA. Wheat and Rye Investigations:

The more important investigations under way are the following:

- a. Varietal comparisons to determine quality and adaptation, and to increase acreage of best varieties.
- b. Breeding to increase yield and quality, with resistance to drought and disease.

BUREAU OF PLANT INDUSTRY (Continued)

- c. Registration of new varieties on basis of performance as an aid to varietal standardization and seed certification.
- d. Genetic research on inheritance of important quantitative characters, such as winter hardiness, disease resistance, straw strength, and quality.
- e. Cultural and tillage experiments, including rates and dates of seeding, seeding in furrows, and pasturing and mulching, especially as an aid to northward expansion of winter-wheat growing.
- f. Physiological studies to determine the distribution of specialized forms of disease organisms and effect of environment on infection.
- g. Physiological studies on effects of stage of development and of environmental factors (temperature, light, etc.) on chemical composition.
- h. Milling and baking and protein studies to determine wheats best adapted for different commercial purposes.

These studies are carried on under the following sub-projects:

- 1. Eastern wheat and rye investigations in cooperation with New York, Purdue University (Ind.), Missouri, Tennessee, North Carolina, and Kansas Experiment Stations, and the Georgia State College of Agriculture, and independently at Arlington Experiment Farm.
- 2. Hard Red Spring and Durum Wheat Improvement in cooperation with Minnesota, North Dakota, South Dakota, Montana, and Wyoming Experiment Stations.
- 3. Hard Red Winter Wheat Improvement in cooperation with the State Agricultural Experiment Stations of Kansas, Nebraska, and Montana.
- 4. Pacific Northwest Wheat Improvement in cooperation with the State Agricultural Experiment Stations of Washington, Oregon, and Idaho. This section produces mostly white wheat, including white club wheats. Some hard red spring, hard red winter, and soft red winter wheats also are grown.
- 5. Southwestern Wheat Improvements. (California, Arizona, Utah.) This section produces white wheats chiefly. Now cooperating with State of California.

B. Oat Investigations:

The problems under investigation are similar to those listed under Wheat and Rye investigations and are carried on under the following sub-projects:

- 1. Spring-oat Improvement in cooperation with the California, Idaho, Iowa, Kansas, Missouri, Montana, Nebraska, New York (Cornell, North Dakota, and Oregon Experiment Stations.
- 2. Winter Oat Improvement: Independently at the Arlington Experiment Farm, Rosslyn, Va., and cooperatively with the Georgia State College of Agriculture.

BUREAU OF PLANT INDUSTRY (Continued)C. Barley Investigations.

Barley investigations are conducted in cooperation with State Agricultural Experiment Stations in widely distributed States, with collaboration from Canadian Stations.

- a. Production of hybrids to use in composite crosses to produce new and superior barleys.
- b. Genetic studies to determine the laws of inheritance.
- c. Breeding studies to develop varieties superior in yield, quality, disease resistance, etc.
- d. Introduction and testing of foreign barleys to obtain new and valuable breeding stocks.
- e. High-altitude studies to find varieties suitable for ranches in high valleys subject to summer frosts.
- f. Assembling and interpretation of all available information on varietal performance in the United States and Canada.
- g. Physiologic studies on nature and rate of development of the barley plant and kernel.

D. Rice Investigations.

The activities in rice investigations are conducted in two widely separated areas, namely, the Mississippi Valley and California.

1. In the Mississippi Valley (In cooperation with the stations in Louisiana and Missouri (agronomy and Arkansas (rice diseases). The varieties grown are chiefly long-grain and medium-grain rices.
 - a. Developing improved varieties by selection for yields, quality, and other characters desired.
 - b. Varietal comparisons to determine best adapted sorts.
 - c. Fertilizer experiments to maintain yields and quality of rice on old land.
 - d. Rotation and weed control studies to destroy red rice and maintain fertility.
 - e. Adaptation of rice in Missouri, north of the recognized rice belt.
2. In California (At first independently, but recently cooperatively with the California Agricultural Experiment Station). The varieties grown are almost entirely short-grain (Japanese)rices.
 - a. Developing improved varieties by selection for characters adapted to California conditions.
 - b. Varietal and strain comparisons in plots and nursery.



BUREAU OF PLANT INDUSTRY (Continued)

- c. Introduction of early-maturing strains from Japan and China.
- d. Fertilizer studies to maintain the productivity of rice lands.
- e. Water-grass control. Various water grasses and weeds make rice farming difficult and expensive after the first few years.
- f. Rate-, date-, and method-of-seeding experiments to obtain and maintain stands under different conditions.
- g. Breeding studies to develop better adapted varieties through hybridization.
- h. Genetic studies to determine the inheritance of plant characters of importance in breeding.

E. Grain-sorghum and Broomcorn Investigations.

The investigations of grain sorghums (kafirs, milos, durras, feteritas, etc.) and of broomcorns are conducted cooperatively with State Agricultural Experiment Stations or other Federal agencies in the Southern Great Plains area and the Far Southwest.

- a. Introduction and testing of foreign varieties, including large numbers of kafirs, durras, milos, and feteritas from Africa, durras from Western Asia and India, and kaoliangs from China, also broomcorns.
- b. Breeding improved varieties by selection and hybridization.
- c. Cultural investigations, including rates, dates, and methods of seeding and spacing.

F. Flax Investigations.

Seed-flax investigations are conducted in cooperation with State and other stations in Minnesota, North Dakota, and Montana, and less extensively in Kansas and Texas

- a. Varietal tests of commercial and newly developed flaxes.
- b. Breeding for yield and quality and for resistance to wilt and rust.
- c. Moisture content of flaxseed in relation to combine-harvesting and storage problems.
- d. Results from previous activities. Flax can be grown profitably in mixture with wheat under subhumid conditions, and the methods and seeding rates have been published.

G. Corn Investigations.

These activities are conducted in cooperation with State Agricultural Experiment Stations or other agencies in New York, Ohio, Illinois, Iowa, North Dakota, Kansas, Missouri, Louisiana, Georgia, South Carolina, and Tennessee, and independently at Arlington Experiment Farm, Rosslyn, Va.

- a. Varietal comparisons in nine States to determine the most profitable strains.
- b. Cultural experiments in five States to determine the most profitable methods of seedbed preparation, and of planting and cultivating corn.
- c. Selecting and selfing through a period of years to obtain superior, true-breeding strains in nine States, and testing these in hybrid combinations of different complexities to increase yield, quality and resistance to insects and diseases, and to determine the most efficient methods of corn improvement.

CEREAL PATHOLOGY

Under Cereal Pathology the following lines are studied:

A. Bacterial and Virus Disease Investigations:

1. Bacterial Diseases of Cereals.

- a. Bacterial streak disease of sorghum and its control by selection of resistant strains.
- b. Bacterial translucent stripe disease of sorghum and its control by selection of resistant strains.
- c. Bacterial dwarfing and soft rot of central axis of sorghum plants, to determine cause, relation to chinch bug injury, possibility of soil transmission, and varietal resistance and other methods of control.
- d. Oat-blast studies to determine cause and relation to climatic factors.
- e. Bacterial stalk rot and leaf blight of corn. Studies to determine causal organism, life history, and control measures.

2. Mosaic-rosette Disease of Wheat and Other Small Grains. This disease has caused sever losses in parts of Illinois, Indiana, and North Carolina, and occurs in Maryland and Virginia.

- a. Relation of the virus to the soil, including longevity in the soil, possible transmission vectors, etc.
- b. Effect of environmental factors (air and soil temperature, soil type, moisture, etc.) on infection.

- c. Studies of mosaic types occurring in different small grains.

3. Corn Mosaic Studies.

- a. Reaction studies of corn varieties and strains to mosaic in the Gulf Coast States.
4. Fundamental Studies on Viruses. Owing to the great difficulty of studying the viruses of any of the cereal or grass mosaics, these fundamental studies are conducted with viruses causing mosaic on tobacco, tomatoes, etc.
- a. Development of quantitative methods for studying virus concentrations in nature and in research material.
 - b. Virus purification studies to develop methods of obtaining pure viruses for further study of their fundamental nature.
 - c. Studies of the virus types occurring on each of several different host plants.

B. Sac-and-Imperfect-Fungi Investigations:

1. Corn Root-, Stalk-, and Ear-Rots, embracing a study of:

- a. Pythium root-rot, to determine factors influencing infection, and to develop resistant strains.
- b. Diplodia and Givverella root-, stalk-, and ear-rots, to determine factors influencing infection, and to develop resistant strains.
- c. Penicillium seedling blight, to determine factors influencing infection and to develop resistant strains.
- d. Breeding by selfed lines and new combinations for yield and quality, with resistance to root-, stalk-, and ear-rots.
- e. Effects of phosphate, potash, and nitrogen deficiencies on susceptibility to rot diseases, and on yield and quality of corn.
- f. Seed treatments with chemicals to control rot diseases.
- g. Cold-resistance studies, and the effects of such resistance on the seed value of the seed products.

2. Wheat Foot-Rots, embracing a study of:

- a. Take-all of wheat, determining factors influencing infection, and developing control measures.

BUREAU OF PLANT INDUSTRY (Continued)

- b. *Helminthosporium* foot-rot (northern Great Plain area), determining factors influencing infection, and developing control measures.
 - c. *Fusarium* foot-rot (Kansas, Oklahoma, Colorado), determining causal fungus, and factors influencing infection and developing control measures.
 - d. New foot-rot of wheat (Oregon and Washington), determining cause and factors influencing infection, and developing control measures.
3. Wheat and Barley Scab and Seedling Blight, embracing a study of:
- a. Wheat scab, determining effects on plant and seed and developing resistant strains.
 - b. Barley scab, including a field survey of distribution and severity of infection, a biochemical study of infected kernels at different stages of development, and seed treatment to improve palatability of scab-infested grain.
4. Flax Diseases other than Rust, including a study of:
- a. Flax wilt, to determine possible physiologic forms and to develop more resistant strains.
 - b. Flax pasmo, to determine sources and methods of infection and factors influencing infection, and to develop control measures.
 - c. Flax boll-blight, to determine cause and control measures.
5. Barley Stripe Disease (Eastern United States) including:
- a. Seed treatments by dust fungicides, studies of relation of soil moisture to infection, and breeding resistant strains.
6. Nematode Disease of Wheat and Rye, embracing studies of :
- a. Relative resistance of various cereals and grasses, effect of age on galls and environmental factors on virulence and infection, and the method of gall formation.
- C. Cereal Rust Investigations.

Most of these rusts are widely distributed and sometimes extremely destructive. Investigations are conducted cooperatively at several state Agri-

BUREAU OF PLANT INDUSTRY (Continued)

cultural Experiment Stations, especially Minnesota, Iowa, Indiana (Purdue University), Kansas, and Idaho.

1. Stem Rusts of Wheat, Oats, Barley, and Rye, embracing studies of:

- a. Epidemiology, including relation of weather, soil, overwintering, the common barberry, and other factors, to the initiation and spread of rust epidemics.
- b. Physiologic-form specialization, to determine factors affecting origin and relative virulence, and effects of light, temperature, and soil on virulence.
- c. The nature of resistance to stem rust, including biochemical determinations of possible relation of cell-sap acidity, sugars, proteins, and other plant-juice constituents to relative resistance to rust, and morphologic and physiologic differences in rust-susceptible and rust resistant varieties.
- d. Cytology, to determine the interaction of fungus and host tissues at and after infection, and to discover the possible origin of physiologic forms of rust in the secondary host (common barberry).
- e. Breeding and selection of wheat and oats for resistance to stem rust.

2. Leaf Rusts of Wheat, Barley, Rye, Corn, and Sorghum, embracing studies on:

- a. Epidemiology, including effects of weather, soil, spore-viability, and other factors on the initiation and spread of rust epidemics.
- b. Physiologic-form specialization, to determine factors affecting origin and relative virulence, and effects of light, temperature, and soil virulence.
- c. Breeding and selection of these cereals for resistance to their leaf rusts.
- d. Life-histories of rusts on actual or possible alternate hosts.
- e. Control of leaf rust of wheat by sulphur and other dust fungicides.

3. Crown Rust of Oats, embracing studies on:

- a. Epidemiology, to determine the relation of certain perennial wild grass hosts to overwintering, propagation, and spread of crown rust, and the possible relation of buckthorn species to general epidemics.
- b. Physiologic-form specialization, to determine factors affecting origin and relative virulence, and effects of light, temperature, and soil on virulence.

BUREAU OF PLANT INDUSTRY (Continued)

c. Cytology to determine fundamental facts on the origin of cluster-cup spores to crown rust and possible relation of crossing of plus and minus strains of pycniospores to origin of physiologic forms.

d. Breeding and selection of crown-rust resistance.

4. Stripe Rust of Wheat, Barley, and Rye, embracing studies on:

a. Epidemiology, including distribution, host relationships, and relation of climatic and soil factors to the development and spread of epidemics.

b. Physiologic-form specialization, including collection and identification of physiologic strains and determining relative virulence.

c. Breeding and selection to obtain resistant strains.

d. Cytology of infection to determine the nature of rust parasitism and fundamental factors underlying resistance.

5. Flax Rust, embracing studies on:

a. Epidemiology, including climatic, soil, and other factors affecting the origin and spread of rust.

b. Physiologic-form specialization, including collection and identification of flax rust from widely separated localities and from wild and cultivated species.

c. Breeding and selection to obtain hybrids of rust-resistant Argentine flaxes on other rust-susceptible but otherwise desirable varieties of seed and fiber flax.

D. Smut Investigations.

Most of these smuts are widely distributed and sometimes extremely destructive. Investigations are conducted independently at Arlington Experiment Farm, Rosslyn, Virginia, and cooperatively with several State agricultural experiment stations.

1. Stinking Smuts of Wheat, embracing studies of:

a. Breeding to develop desirable resistant strains.

b. Physiologic forms, to determine number, origin, spread, and relative virulence.

c. Seed treatments with chemical dusts to control stinking smuts.

2. Loose Smut of Wheat, embracing studies on:

a. Influence of atmospheric moisture on occurrence, distribution, and control.

BUREAU OF PLANT INDUSTRY (Continued)

- b. Influence of soil temperature on the development of loose smut in wheat grown from seed known to be infested.
 - c. Resistance to loose smut in varieties resistant to rust, stinking smut, and other diseases.
3. Oat Smuts, embracing studies of:
- a. Seed treatments with chemical dusts.
 - b. Influence of atmospheric moisture on the occurrence, distribution, and control of the loose smut of oats.
 - c. Effect of hulls on the resistance of different varieties.
 - d. Breeding for resistance and quality.
4. Covered Smut of Barley, embracing studies of:
- a. Effect of depth of seeding on development of covered smut.
 - b. Seed treatments with chemical dusts.
5. Loose Smut of Barley, embracing studies of:
- a. Influence of atmospheric moisture on occurrence, distribution, and control.
 - b. Seed treatments with chemical dusts.

(m) BARBERRY ERADICATION

Appropriation, 1930 \$379,920
 Budget, 1931 379,920

This is a new item continuing the Barberry Eradication heretofore carried as a part of the general appropriation for Cereal Crops and Diseases.

Project Statement

<u>Project</u>	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>
Barberry eradication	\$374,032	\$ 379,920	\$ 379,920

BUREAU OF PLANT INDUSTRY (Continued)Activities under this AppropriationGeneral

The 13 north-central wheat producing States, Colorado, Illinois, Indiana, Iowa, Michigan, Minnesota, Montana, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin, and Wyoming are cooperating to eradicate the common barberry, an intermediate host of the wheat stem rust throughout this area as a means of controlling epidemics of black stem rust of wheat and other small grains.

There was no widespread epidemic of stem rust of wheat in 1928, but the evidence shows that such limited local and regional epidemics as developed in 1928 were produced from barberry infections. In the cooperative campaign for the eradication of the barberry, a larger percentage of barberry bushes and seedlings was killed with salt and kerosene in 1928 than ever before. Although other chemicals were tested for this purpose during the year, none were found to be as effective, cheap, and easy to obtain and apply as these two. During the year a grand total of 1,489,014 escaped bushes and seedlings were destroyed. This is more than 99 percent of the total number of bushes destroyed during the year.

During the fiscal year 1930 the cooperating States expect to contribute \$93,490 to the eradication campaign.

(n) TOBACCO INVESTIGATIONS

Appropriations, 1930	\$70,310
Budget, 1931 ,	<u>80,310</u>
Increase	\$10,000

(1) The increase of \$10,000 is submitted for reorganizing and strengthening the tobacco disease work. The need is especially urgent for developing and demonstrating effective methods of control of wildfire, root knot, mosaic, wilt, root rot and other destructive parasitic field diseases, some important nutritional maladies and fungus maladies which cause heavy damage in the curing and fermentation processes, including mould, must, pole sweat and black rot. The losses from disease aggregate several million dollars annually, seriously reducing the profit of the grower and increasing the cost of leaf tobacco to the manufacturer. Funds now available are quite inadequate for properly organizing and prosecuting the work in

BUREAU OF PLANT INDUSTRY (Continued)

the several tobacco-growing districts and there is urgent need of extending the work along the lines indicated.

Project Statement

<u>Project</u>	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>	<u>Increase</u>
Tobacco Investigations	\$ 68,778	\$ 70,310	\$ 80,310	\$10,000(1

Activities under this AppropriationGeneral

Tobacco investigations include all phases of growing, curing and handling tobacco, with the exception of tobacco insects and their control. The work consists of studies on tobacco diseases and their control, laboratory research on causes of poor quality in leaf tobacco and field investigations in the improvement of methods of growing, curing and handling the different types of leaf.

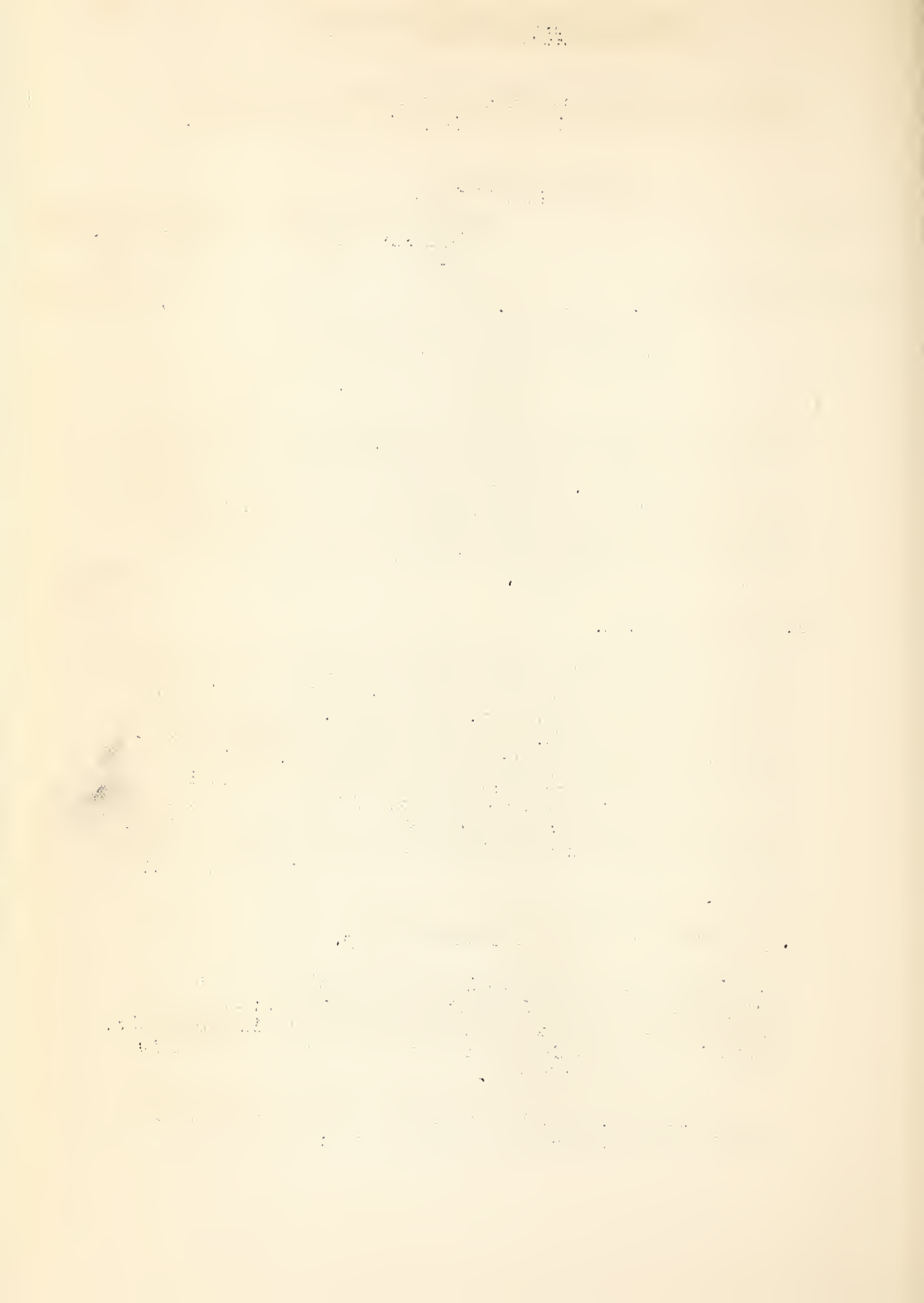
1. Washington D. C.

Washington activities include laboratory study of experimental material grown in the field, such as measurement of nicotine content, burning qualities, aroma, etc., and nature of the chemical changes taking place in curing and fermentation; also greenhouse and laboratory study of diseases. This work has made possible the improvement of burning qualities by better fertilizing and application of better methods in growing, curing and sweating leaf tobacco. The work furnishes information of a fundamental character which serves as a basis for planning sound field experimentation along practical lines.

2. Cigar Binder and Filler Investigations.

In Wisconsin, the work is located at Madison and is in cooperation with the State Experiment Station; in Pennsylvania the work is in Lancaster County in cooperation with Pennsylvania State College; the work in New York is carried on by this bureau.

Production of improved, disease resistant binder and filler types by breeding and selection; improving the



BUREAU OF PLANT INDUSTRY (Continued)

quality of the leaf by proper use of commercial fertilizer as a supplement to barnyard manure; control of pole sweat in the curing barn and black rot, mould and must in the sweat rooms are major problems. Types of binder leaf highly resistant to root rot which have been developed are being extensively grown and similar filler types are needed. Improved fertilizing has materially raised the quality of the leaf.

3. Flue-cured Tobacco Investigations.

In North Carolina the work is located at Oxford and Rocky Mount and is in cooperation with the State Department of Agriculture and Experiment Station; in Georgia, the work is located at Tifton, in cooperation with the Georgia Coastal Plain Experiment Station and the State College of Agriculture.

Principal problems under study are: Methods of handling seed beds; best varieties for producing flue-cured leaf; best soils for this type; correct methods of fertilizing the crop; control of diseases. Information of great value concerning fertilizer requirements on different soils has been obtained and has materially modified the manufacture and use of tobacco fertilizers. Discovery of use of magnesia to prevent the sanddrown disease has added greatly to the value of the crop. Important discoveries have recently been made regarding the effects on tobacco of chlorine in the fertilizer. During the past season much damage to the crop was caused by use of this element in excess. A remedy for tobacco wilt has been found in the use of suitable cropping systems. Efforts are now being made to work out the control of black shank, root knot, wildfire and mosaic.

4. Burley Tobacco Investigations.

This work is conducted at the State Experiment Station of Tennessee and is cooperative; in West Virginia, the work is located at the Lakin sub-station of the State Experiment station and is cooperative.

The principal features are: the production of types of Burley which are resistant to root rot and give better yields; determination of the best types of soil for Burley; study of the fertilizer requirements of the crop. The work has been under way only a short time but thus far excellent results have been obtained in selecting disease resistant strains of Burley.

BUREAU OF PLANT INDUSTRY (Continued)

5. Maryland Tobacco Investigations.

The work is located at Upper Marlboro in cooperation with the Maryland Experiment Station.

A comprehensive study of cropping systems for tobacco, fertilizer requirements of the crop including the comparative values of the newer synthetic fertilizer materials, management of tobacco seed beds, development of improved varieties and strains of tobacco by breeding and selection are the chief problems receiving attention. Some rather remarkable results have been obtained in the effects of other crops on the yield and quality of tobacco. The discovery that on many soils in addition to the usual elements magnesium and calcium must be supplied in the fertilizer for tobacco and other crops is especially timely in relation to present trends in the fertilizer industry, and it seems likely that some readjustments in fertilizer manufacture will be found necessary.

6. Dark Air-Cured Tobacco Investigations.

The work is located at the Caroline County Station of the Virginia Experiment Station and is conducted cooperatively.

A comprehensive study of the comparative effects of crop plants on yields of succeeding crops in the rotation, with special reference to sun-cured tobacco, and the role of fertilizers in influencing these effects. As illustrating the results tobacco after corn requires more fertilizer, particularly as to potash, than when following a crop of tobacco. The proper system of rotation, and the fertilizer needs in tobacco culture are both intricate problems but the two are rather closely inter-related.

7. Cigar Wrapper Investigations.

The work is located at Windsor, Connecticut, and Amherst, Massachusetts, and is in cooperation with the State Experiment Stations. In Florida, the work is carried by the Bureau.

These studies are devoted mainly to diseases and their control, more especially mosaic, wildfire and the soil disease known as brown root rot. The latter trouble which seriously affects the yield is greatly influenced by the cropping system. It has been found that on soils subject to this trouble ordinary systems of rotation with soil-improving crops can not be used to control the well known black root rot. Such crops as clover, for example, have a remarkably depressing effect on the growth of tobacco. Continuous culture of strains of tobacco highly resistant to the black root rot rather than shifting the crop offers promise as a means of avoiding the brown root trouble and at the same time reducing damage from the black root to a minimum.

BUREAU OF PLANT INDUSTRY (Continued)(c) SUGAR PLANTS

Appropriation, 1930	\$257,000
Budget, 1931	<u>262,000</u>
Increase	5,000

- (1) The increase of \$5,000 is submitted for testing sugar cane varieties for adaptation to conditions in Louisiana.

Yields of cane and sugar per acre are lower than those obtained in other countries and urgent need exists for the development and commercial introduction of new varieties of cane superior to the varieties now grown, more resistant to diseases, better adapted for culture, and capable of affording yields of cane and sugar comparable with those obtained in other countries. Additional facilities are needed to provide adequately for the propagation and testing of the large collection of new varieties of cane obtained by the Department's expedition to New Guinea in 1928, and for testing the great number of new seedling varieties produced from these and from other varieties of cane. Larger scale tests conducted under a wider range of local conditions will provide the needed information in less time than is required at present and will enable the Department to place superior disease-resisting varieties of sugar cane into the hands of commercial growers earlier than is possible with present facilities.

Project Statement

<u>Project</u>	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>	<u>Increase</u>
Sugar cane	\$107,240	\$117,000	\$122,000	\$5,000 (1)
Sugar beets	93,842	140,000*	140,000*	-
Total	\$201,082	\$257,000	\$262,000	\$5,000

*In addition to this amount, there is an allotment of \$145,926 for work on curly-top disease of sugar beets from the item for Leafhopper and Curly-Top Research in the Miscellaneous section.

Activities under this AppropriationGeneral

Investigations of sugar cane and sugar beets are under way, including breeding for the production of types better adapted to conditions

BUREAU OF PLANT INDUSTRY (Continued)

in the United States, comparative studies of cultural practices, and disease-control experiments.

1. Sugar Cane

- (a) Sugar Cane Breeding.— The most promising attack on the problem of declining yields of sugar cane due to disease is by the production of superior disease-resistant varieties. From two thousand to fifteen thousand sugar cane seedlings are produced annually at the United States Sugar Plant Field Station, Canal Point, Florida. These are tested for disease resistance, sugar content, habit of growth, etc. This year several hybrid varieties have given excellent results and one of these, possessing the requirements of a commercial cane, promises to materially outyield the standard variety in tests at Houma, Louisiana.
- (b) Sugar Cane Variety Testing.— Variation in yields due to differences in response to local conditions of environment on the part of the varieties of sugar cane relatively well adapted to conditions in general, becomes in the aggregate a very substantial amount when expressed in tons of sugar per year. The important question of determining by well-controlled experiments the varieties of sugar cane best adapted to conditions in the various parts of the cane belt is being rapidly advanced. By our activities along these lines demonstrations have been made that have completely revolutionized the varieties planted commercially in Louisiana, and Georgia, the last remnant of the old varieties in Louisiana having disappeared in the 1929 plantings.
- (c) Diseases still remain as one of the important limiting factors in production of sugar and sirup from cane. Advances are gradually being made in our knowledge of the biology of root disease and mosaic, the major diseases of cane in this country. Satisfactory progress has been made in the development of methods to control mosaic but much remains to be learned about it and about means for reducing root disease losses as well. To date, direct methods of control have not proved practicable but reduction in yields attributable to these diseases have been minimized by substitution of disease-tolerating varieties.

2. Sugar Beets.

- (a) Sugar Beet Agronomy.— To a greater or lesser degree, depending on locality, poor yields of beets are due to poor farming practices, that are surprisingly prevalent in America. This constitutes a problem worthy of careful consideration. In California, Idaho, Utah, Colorado, New Mexico, Nebraska, South Dakota, Minnesota and Michigan experimental work on field practices is in progress. Rational practices have been worked out already in several of the beet

BUREAU OF PLANT INDUSTRY (Continued)

areas but a five to ten year program of experimentation remains in the bulk of the commercial sugar beet belt before practical recommendations can be made.

- (b) Sugar Beet Pathology.— Other than curly-top the principal disease hazards involved in sugar beet culture are leaf spot, seedling diseases, nematode injury, and storage rots. A satisfactory report of progress in the elucidation of cause and conditions favoring the development of these diseases can be made. Furthermore, methods have been worked out for control that are relatively satisfactory. Dusting with fungicides for leaf spot, rotation for nematodes, delayed thinning and improved drainage for seedling diseases and modified storage practices in dumps and bins for the control of rotting after harvest have proved of great value. However, the ideal method of control, namely, development of improved disease-resistant strains of beets is only in its incipency in respect to several of these maladies, and while in the case of leaf spot some definite progress has been made, it remains for the future to determine if the efforts now being made along this line of attack are fruitful of valuable results.

These activities and the investigations carried on under the special item for Leafhopper and Curly-Top Research, in the Miscellaneous Section, are administered as a single general project. The notes explaining the special item in the "Miscellaneous Section" contain a more complete outline of the sugar beet disease investigations.

(p) BOTANY

Appropriation, 1930\$53,800

Budget, 1931 53,800

Project Statement

<u>Project</u>	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>
Economic botany	\$24,814	\$ 25,927	\$ 25,927
Weed investigations	7,093	7,240	7,240
Blueberry investigations	6,914	6,193	6,193
Grass investigations	<u>14,344</u>	<u>14,440</u>	<u>14,440</u>
Total	\$53,165	\$ 53,800	\$ 53,800

Activities under this AppropriationGeneral

The work includes the identification of plants for the various bureaus and branches of the Department and for other organizations and individuals doing similar work. For this work of identification the office maintains an

Die Aufgabe der Politik ist es, die Interessen der Bürger zu vertreten und die öffentliche Ordnung zu gewährleisten. In der Demokratie ist die Politik durch die Bürger kontrolliert und legitimiert. Die Politik muss die Interessen der Bürger in Einklang mit den Interessen der Nation bringen. Die Politik muss die öffentliche Ordnung und die Sicherheit der Bürger gewährleisten. Die Politik muss die Wirtschaft und die soziale Gerechtigkeit fördern. Die Politik muss die Kultur und die Wissenschaft unterstützen. Die Politik muss die Umwelt und die Natur schützen. Die Politik muss die internationale Zusammenarbeit fördern. Die Politik muss die Frieden und die Stabilität der Welt gewährleisten. Die Politik muss die Gerechtigkeit und die Gleichheit fördern. Die Politik muss die Freiheit und die Selbstbestimmung der Bürger gewährleisten. Die Politik muss die Entwicklung und den Fortschritt der Nation fördern. Die Politik muss die Lebensqualität der Bürger verbessern. Die Politik muss die Zukunft der Nation sichern. Die Politik muss die Interessen der Bürger in Einklang mit den Interessen der Nation bringen. Die Politik muss die öffentliche Ordnung und die Sicherheit der Bürger gewährleisten. Die Politik muss die Wirtschaft und die soziale Gerechtigkeit fördern. Die Politik muss die Kultur und die Wissenschaft unterstützen. Die Politik muss die Umwelt und die Natur schützen. Die Politik muss die internationale Zusammenarbeit fördern. Die Politik muss die Frieden und die Stabilität der Welt gewährleisten. Die Politik muss die Gerechtigkeit und die Gleichheit fördern. Die Politik muss die Freiheit und die Selbstbestimmung der Bürger gewährleisten. Die Politik muss die Entwicklung und den Fortschritt der Nation fördern. Die Politik muss die Lebensqualität der Bürger verbessern. Die Politik muss die Zukunft der Nation sichern.

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BUREAU OF PLANT INDUSTRY (Continued)

authentically named collection of cultivated plants, and for wild plants it uses the National Herbarium. The domestication and improvement of one of our wild fruits, the blueberry, has been undertaken.

Economic Botany

Under this project the Department maintains a corps of experts whose duty it is to identify plants for any economic purpose of the Department, or for any correspondent of the Department. The Department has cooperated in the preparation of Standardized Plant Names, a publication issued by the American Joint Committee on Horticultural Nomenclature, which is now the basis of the correct naming of plants in the nursery trade.

Weed Investigations

In cooperation with other Federal agencies, such as the Forest Service and Bureau of Animal Industry, and with State agricultural experiment stations, preliminary field studies have been made of the following especially troublesome weeds: Perennial sowthistle, wild garlic, field bindweed, wild oat, goatgrass, squirreltail grass, blueweed sunflower, locoweeds, Austrian fieldcress, nutgrass, Canada thistle, water-hyacinth, perennial peppergrass, puncturevine, Russian knapweed, poison-ivy, Japanese honeysuckle, coyotillo (a poisonous range shrub of Texas), and many pasture, range, and lawn weeds.

Blueberry Investigations

Through its blueberry experiments the Department has found out how to grow these plants and how to propagate any desirable kind, and after bringing into fruit about 35,000 pedigreed seedlings it has selected eleven of the best of them for propagation as named horticultural varieties. The industry of blueberry culture which has developed in the acid soil of the pine barrens of New Jersey as the result of these experiments is now thriving and extending. The growers have organized themselves as the Blueberry Cooperative Association, which markets their crop cooperatively.

The Department is now engaged in blueberry experiments in North Carolina, which give promise of resulting in the establishment of blueberry culture in certain sandy, acid soils of the North Carolina coastal plain.

The Department has also begun experiments in the breeding of improved blueberries suited to the climatic conditions of Florida. During the past summer fruiting hybrids have been obtained between the native rabbiteye blueberry of Florida and one of the Department's northern hybrids.

BUREAU OF PLANT INDUSTRY (Continued)Grasses

Because of the importance of grasses to American agriculture the Department has brought together a grass herbarium which is the largest and most useful collection of grasses in the world. From the grass expert in charge of it, and from his assistants, have come many valuable reports on the useful grasses of the world. A manual of the grasses of the United States, many years in preparation, is now approaching completion.

(q) DRY LAND AGRICULTURE

Appropriation, 1930	\$333,900
Budget, 1931	363,900
Increase.....	<u>30,000</u>

The increase of \$30,000 is submitted for the following purposes:

(1) \$25,000 for the Central Great Plains Field Station. The amount carried in the regular appropriation act for the Central Great Plains Field Station for the fiscal year 1930 is \$75,000. The Second Deficiency Act, 1929, carried the sum of \$25,000 for the same purpose. This amount was made immediately available, all of it was expended prior to July 1, 1929; that is, during the fiscal year 1929. The \$75,000 carried in the regular act is not sufficient to care for the needs of the station during the fiscal year 1931, and there is, therefore, a request for an increase of \$25,000 for the work for 1931, making the total amount for 1931 \$100,000. With this increase, nurseries for the production of plants for use in cooperative shelter belts will be established, distribution of planting stock to farmers will be started, and experiments in the breeding and testing of trees, fruits, and other plants and crops will be conducted. Experiments will be conducted under both dry-land conditions and irrigation.

(2) \$5,000 for hard red winter wheat improvement research. A similar item, but in the amount of \$20,302 is carried in the subappropriation for Cereal Crops and Diseases. It is desired to extend the investigations with this wheat to the Kansas and Oklahoma Dry Land Field Stations, in addition to the work proposed to be done with the Cereal Crops and Diseases increase.

BUREAU OF PLANT INDUSTRY (Continued)

<u>Project</u>	<u>Project Statement</u>			<u>Increase or decrease</u>
	<u>Expended 1929</u>	<u>Estimated 1930</u>	<u>Estimated 1931</u>	
Washington, D. C.....	\$ 28,149	\$ 27,920	\$ 27,920	- - -
Akron, Colorado.....	10,641	10,500	10,500	- - -
Archer, Wyoming.....	3,892	3,900	3,900	- - -
Ardmore, South Dakota.....	21,791	20,780	20,780	- - -
Newell, South Dakota	4,249	4,500	4,500	- - -
Big Spring, Texas.....	9,078	9,100	9,100	- - -
Colby, Kansas.....	3,699	3,700	3,700	- - -
Dalhart, Texas.....	9,201	9,100	9,100	- - -
Dickinson, North Dakota.....	5,598	5,100	5,100	- - -
Garden City, Kansas.....	3,918	3,900	3,900	- - -
Havre, Montana.....	4,693	4,700	4,700	- - -
Hays, Kansas.....	5,739	5,600	5,600	- - -
Huntley, Montana.....	4,844	4,800	4,800	- - -
Lawton, Oklahoma.....	9,598	9,600	9,600	- - -
Mandan, North Dakota.....	45,958	45,500	45,500	- - -
Moccasin, Montana.....	4,108	3,850	3,850	- - -
North Platte, Nebraska	5,440	5,450	5,450	- - -
Pendleton, Oregon.....	9,942	9,000	9,000	- - -
Sheridan, Wyoming.....	11,036	10,100	10,100	- - -
Tucumcari, New Mexico.....	9,042 (b)	34,183 (a)	9,200	-24,983
Woodward, Oklahoma.....	17,377	17,600	17,600	- - -
Central Gr. Plains Field Station...	119,518 (c)	75,000	100,000	+25,000
Southern Gr. Plains Field Station	- - -	35,000	35,000	- - -
Southern Gr. Plains hard red winter wheat.....	- - -	- - -	5,000	+ 5,000
Total	347,491 (b)	358,883 (a)	363,900	+ 5,017

(a) Includes \$24,983 from Second Deficiency Act, 1929.

(b) Includes \$ 17 from Second Deficiency Act, 1929.

(c) Includes \$25,000 from Second Deficiency Act, 1929.

Activities under this AppropriationGeneral

The office of dry land agriculture was organized in 1905 for the purpose of investigating the problems of the agricultural and horticultural development of the Great Plains area. This area includes all of Montana, North and South Dakota, Nebraska, Wyoming, Colorado, Kansas, Oklahoma, Texas, and New Mexico lying between the 5,000-foot contour on the eastern slope of the Rock Mountains and the 98 meridian of longitude. All this region is classed as semiarid. The normal annual precipitation ranges from as low as 10 inches to as high as 30 inches, by far the larger portion of it, however, having from 12 to 15 inches.

BUREAU OF PLANT INDUSTRY (Continued)

At all of the stations work is designed to obtain the fullest possible information concerning soil and climatic conditions throughout the region adjacent to each station and throughout the Great Plains region as a whole, also the agricultural effectiveness of each of the many different methods of tillage and crop rotations that can be considered as more or less suitable for this region.

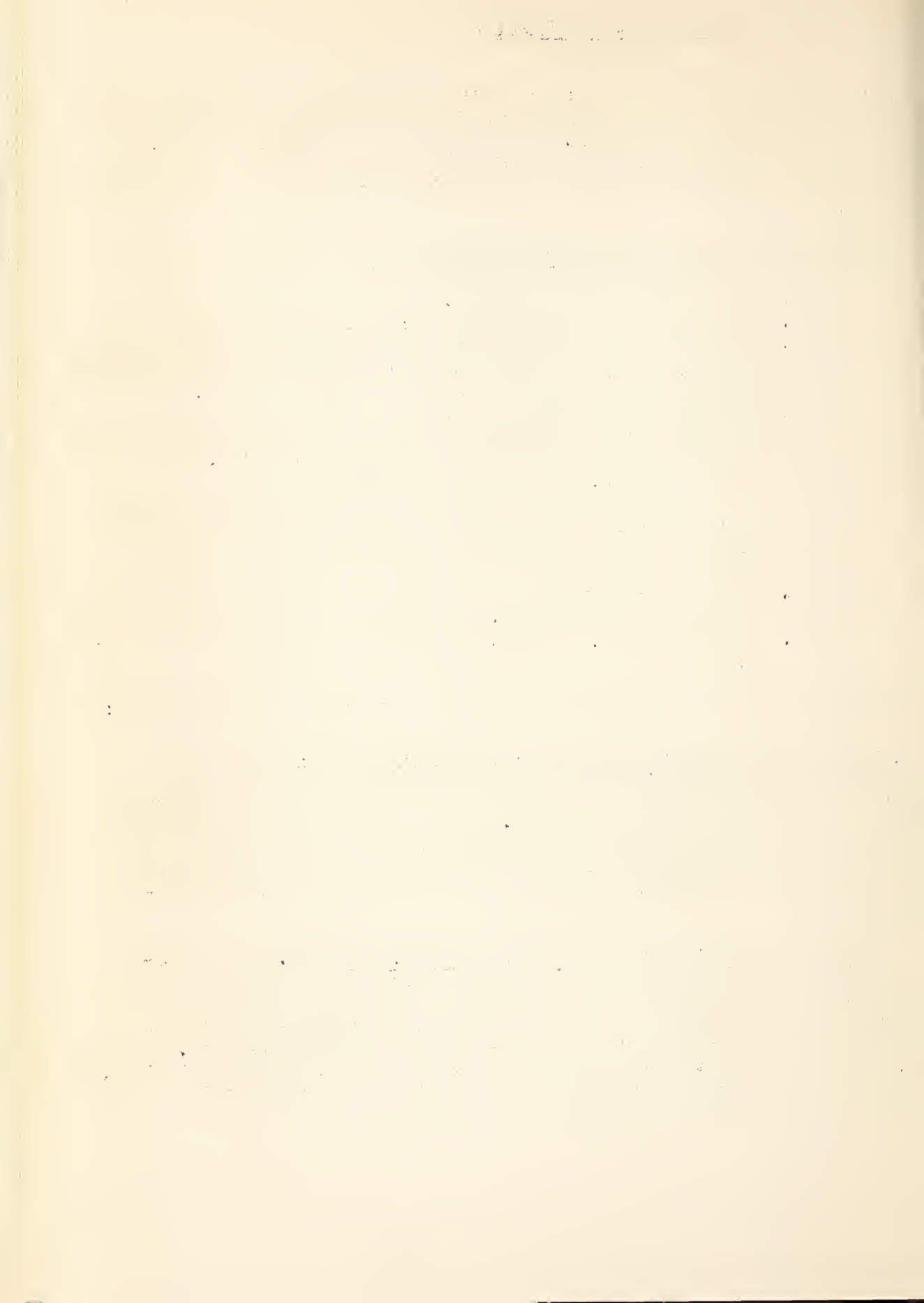
The following problems are under general study:

- a. Depth and manner of plowing.
- b. Tillage after plowing for preparation of seed bed.
- c. Intertillage between rows during the growth of rowed crops.
- d. Alternate cropping and summer tillage of various degrees of intensity and at longer or shorter intervals of time.
- e. Rotations and crop sequence.
- f. Selection and adaptation of various crops and varieties and strains of crops for different localities and soils.
- g. Methods, rates, and time of seeding.
- h. Time and methods of harvesting and utilization of crops, so as most completely to utilize the scanty rainfall and to insure a continuous supply of sustenance for the farmer's family and livestock.
- i. The establishment of shelterbelts around the farmstead for the protection of the home.
- j. Kitchen garden, orchard, small fruit, and ornamental plantings.

The following stations have been established within the past few years:

Central Great Plains Field Station, Cheyenne, Wyoming. Activities have been centered upon the construction of necessary buildings at the station. Construction work is being rushed to completion and the experimental work is gradually being introduced. The activities at the Cheyenne Station are for the advancement of agriculture in that region and will be somewhat similar in character to those at the Northern Great Plains Field Station, Mandan, North Dakota, including the cooperative shelter-belt distribution work.

Southern Great Plains Field Station, Woodward, Oklahoma. The introduction of the cooperative shelter-belt work at Woodward will extend the same benefits to the farmers of the Southern Great Plains region that have been shared by the producers in the Northern Great Plains as a result of the shelter-belt work conducted at the Northern Great Plains Field Station, Mandan, North Dakota. Steps are being taken to erect the necessary buildings, to procure the necessary equipment and other details to carry out this work at the Woodward Station.



BUREAU OF PLANT INDUSTRY (Continued)(r) WESTERN IRRIGATION AGRICULTURE

Appropriation, 1930	\$145,600
Budget, 1931	150,000
Increase.....	<u>5,000</u>

The increase of \$5,000 is submitted for the following purpose:

(1) Boron investigations: \$5,000 for extending the investigations of the effect of boron in irrigation water and in the soil. Investigations conducted this past season have shown that the injury is not only much more severe in the San Fernando Valley, California, than was supposed but includes also the southern portion of the San Joaquin Valley, certain sections south of Los Angeles, and a number of cultivated areas in the Mojave Desert as well as in western Nevada. These investigations have definitely proven boron to be a major problem of much greater extent than was first supposed and it appears essential that it be dealt with on a larger scale.

Project Statement

<u>Project</u>	<u>Expended,</u> <u>1929</u>	<u>Estimated,</u> <u>1930</u>	<u>Estimated,</u> <u>1931</u>	<u>Increase</u>
Washington laboratory.....	\$ 16,891	\$ 16,395	\$ 16,395	- - -
Belle Fourche, F. S.				
Newell, South Dakota.....	15,720	16,120	16,120	- - -
Huntley, F. S., Huntley				
Mont.	16,360	16,460	16,460	--- -
Scotts Bluff, F. S.				
Mitchell, Nebraska.....	12,200	12,840	12,840	- - -
Yuma F. S., Bard, Calif.	15,200	15,835	15,835	- - -
Umatilla F. S., Hermiston,				
Oregon.....	3,256	3,300	3,300	- - -
Newlands F. S., Fallon,				
Nevada.....	12,000	12,900	12,900	- - -
San Antonio F. S.,				
San Antonio, Texas	12,320	12,500	12,500	- - -
Tucson, Arizona.....	3,900	3,750	3,750	- - -
Prosser, Washington.....	3,500	3,700	3,700	- - -
Boron Investigations.....	<u>31,800</u>	<u>31,800</u>	<u>36,800</u>	<u>\$5,000</u>
Total	143,147	145,600	150,600	5,000

BUREAU OF PLANT INDUSTRY (Continued)Activities under this AppropriationGeneral

The investigations are carried on at field stations and laboratories established in the western United States. The object is to investigate agricultural conditions and to determine by field studies and experiments the crops, rotations, and cropping methods best suited to successful farming in the arid and semiarid regions of the western United States and, in cooperation with the Reclamation Bureau of the Department of the Interior and the various State experiment stations interested, to work out methods of improving these conditions.

Washington Laboratory: The work as outlined under "General" is supervised from the Washington Laboratory.

Belle Fourche Field Station, Newell, South Dakota: At this station sweet clover as a pasture and soil improvement crop has been tested and its value recently demonstrated. It has advantages over alfalfa because of its more rapid establishment as a pasture and green manure crop and, furthermore, it is less likely to cause bloat in sheep and cattle when pastured during the summer months on the growing crop than is alfalfa. The indications are that sweet clover will prove to be a useful crop on the project, supplementing alfalfa where quicker results are desired in a rotation with other crops, and will further prove to be useful as a summer pasture crop for sheep and cattle. Among the other outstanding results which have been obtained from this station may be noted the value of the rotation experiments begun in 1912.

Huntley Field Station, Huntley, Montana: This station has been notably useful in demonstrating how crop yields may be increased by cultural treatments and the including of soil improvement crops in constructively outlined rotations. The information from these experiments, which have been operating since 1910, has been published, and it shows how crop yields may be maintained at a high standard and even improved over a long period. In conjunction with these tests the economic possibilities of maximum production of the more important crops is being investigated together with the possibilities of the use of commercial fertilizers in maintaining the productiveness of the soil. The value of livestock is being extensively investigated at this station. The possibilities of the extension of the dairy industry are an important activity of this phase of livestock production.

Scotts Bluff Field Station, Mitchell, Nebraska: This station is located in one of the largest irrigated areas in the United States. The information made available from the investigational work of this station may be usefully applied to the entire area. Extensive information is made available on the results from the rotation experiments, the possibilities of dairying, and the investigations conducted on the problems that have to do

BUREAU OF PLANT INDUSTRY (Continued)

with potato production. A reasonable extension of the poultry industry has distinct possibilities and consideration is being given to this phase of livestock. This station now has available much valuable information on how crop yields may be maintained and improved through the accumulated investigations of the rotation and maximum production tests.

Yuma Field Station, Bard, California: Extensive experiments for the purpose of determining the effect of various crop sequences, application of stable manure, and commercial fertilizers on crop yields were inaugurated on this station in 1912. Outstanding results have been obtained along the lines of demonstrating the value of the use of acid phosphate on alfalfa.

Umatilla Field Station, Hermiston, Oregon: Particular attention at this station has been given to the production problems of field crops, various phases of the livestock industry, irrigation problems, and culture of small fruits and vegetables. As alfalfa is the most important crop grown, particular attention is being given to the problem of obtaining high yields and profitable methods of disposition, especially through livestock. *Artemisia Cina*, a drug plant, has been tested at this station and its possibilities demonstrated. This spring 250,000 plants were distributed for planting on the project, and there will be a total of about 50 acres grown this year.

Newlands Field Station, Fallon, Nevada: Experiments in the reclamation of alkali soils have been continued on this station. Further improvement in the formerly unproductive, impermeable soils of the station is being noted. This condition has been brought about partly through more frequent irrigation, improved drainage, and by repeated applications of gypsum. Alfalfa has developed in to an important crop on the project partly because of its value in a well laid out rotation with other crops and also because of its value as a forage for livestock. The Newlands Project is one of the areas in the West where boron in injurious quantities is prevalent, and the extent to which it is a factor limiting crop production is being determined.

San Antonio Field Station, San Antonio, Texas: One of the chief limiting factors in successful cotton and fruit production in the region is the Texas root rot of cotton. Information has been obtained in the rotation experiments to determine the practicability of its control by growing for one or more years crops that are not susceptible to the disease. Since 1916 continuously recorded information is available as to the recurrence of the disease on the 25 plots where cotton is grown. Its effect on a large variety of horticultural and ornamental plants, both native and exotic, has also been recorded, extending over a period of 23 years.

BUREAU OF PLANT INDUSTRY (Continued)

Tucson, Arizona: Analyses of the salt content of irrigation and drainage waters are made in cooperation with the Arizona State Experiment Station.

Irrigation Experiment Station, Prosser, Washington: Investigational work of this station is largely along the lines of improved methods of irrigation, water requirement of field crops, determination of conveyance losses, frequency of irrigation, and the effects of different amounts of water applied to alfalfa as compared with this crop not fall irrigated is being ascertained. A comprehensive survey of the surface and subsurface waters of the Yakima and Klamath Projects was conducted this past season to determine the salt content of each in relation to the sustained productivity of the cultivated land. All this work is conducted in cooperation with the Washington State Experiment Station.

Boron Investigations: This office, in addition to its activities in connection with investigations of problems that have to do with crop production on reclamation projects, has been authorized to conduct investigations relating to the injury caused by boron that occurs in certain irrigation waters in the West. Early in the fiscal year of 1929 two laboratories were established, one at Riverside and the other at Santa Paula, California. From these laboratories a survey has been undertaken to locate the areas in which injurious quantities of boron occur, and a study is being made on the physiological effects of boron on plants. It has been found that boron injury to the more sensitive plants, such as lemons, walnuts and oranges, may occur from the use of irrigation water containing boron in excess of 0.5 parts per million. The physiological investigations have indicated that some crop plants are much more tolerant than others.

(s) HORTICULTURAL CROPS AND DISEASESAppropriation, 1930:

Facial.....	\$ 1,234,731
<u>Less:</u> Phony Peach Eradication, which is submitted for 1931 as a separate item.....	- 85,000
	<u>1,149,731</u>
<u>Plus:</u> Available, 1930, for Black Walnut Investigations in the Middle West provided by Second Deficiency Act, 1929.....	+ 5,000
Total available, 1930	<u>1,154,731</u>
Budget, 1931	<u>1,257,000</u>
Increase.....	<u>102,269</u>

The increase of \$102,269 is submitted for the following purposes:

(1) \$10,000 for false blossom cranberry. This disease threatens to wipe out the industry in the commercial sections, and growers and commercial organizations are much concerned. The disease has increased

BUREAU OF PLANT INDUSTRY (Continued)

greatly during the last four years and changes in bog methods and disease control must be devised if the industry is to be maintained.

(2) \$5,000 for strawberry diseases. Several obscure troubles such as the so-called dwarf, and virus diseases and root rots are widely and seriously prevalent in the Coastal Plain Region from Maryland to Louisiana. They inflict heavy losses on the strawberry industry. Though the dwarf, and virus diseases produce somewhat similar effects, they probably require the use of different methods of control. This increase will make possible more comprehensive investigations directed toward the segregation of the different diseases and the determination of control measures for each.

(3) \$10,000 for diseases of peas and beans. Investigations should be made of root diseases of peas which occur in all sections of the country, and field stations should be established in the seed growing sections of the West and South. Bean diseases should be studied along the Atlantic Seaboard and the Gulf Coast where anthracnose, root rots, and blights are serious. It is not known whether the organisms causing these diseases are carried by the seed or whether they originate in the field and normally inhabit the soil.

(4) \$5,000 for date growing. There is an urgent need for a thorough study of many important problems affecting the profitable production of dates. Information concerning the most desirable soil management, pruning and irrigation practices to follow with this relatively new crop is badly needed. Information relative to the water requirements of different varieties of dates and under different climatic and soil conditions is especially vital at this time.

(5) \$36,227 for pecan investigations as follows:

\$12,500 for pecan investigations in Texas. The pecan industry is in urgent need of detailed studies of the influence of different methods of pecan culture. Especially the Texas conditions of pecan production are so different from the conditions in Louisiana that results of experiments at our Shreveport, La., station will not be directly applicable and may prove to be of no assistance to Texas growers. It is desired to undertake horticultural studies at Brownwood, Tex., in cooperation with the Bureau of Entomology which has maintained a station at that point for the study of insects affecting pecan culture. At the present time the Bureau of Plant Industry is carrying on no work with pecans in Texas.

BUREAU OF PLANT INDUSTRY (Continued)

\$23,727 for pecan work in the East. This increase will make it possible to extend pecan investigational work in Georgia as well as in Mississippi, Alabama and western Florida where practically no work is being done at the present time. A research laboratory will be established in an eastern pecan center where complete studies of the growth and nutrition of the pecan tree and the development of the nuts will be studied. Factors affecting growth of tree, set of nuts, filling of nuts, and regular heavy bearing will be determined.

(6) \$5,000 for strawberry breeding. New hybrid strawberries originated in the Bureau of Plant Industry promise to replace many of our present commercial varieties. This increase is needed for the careful testing of these berries in different parts of the country.

(7) \$16,042 for a study of the factors necessary in high quality fruit. It is desired to determine the correlation of the factors necessary to secure a large yield per tree of high quality fruit of apples, peaches, pears, plums, cherries, quinces, and other fruits. Suitable orchard sites should be determined, pollination studies should be made, and the interrelation of soil management, pruning, thinning, and fertilization as affecting fruit bud production and annual crops should be determined. The effect of different fertilizer elements on the color of the fruit, its firmness, respiration and keeping quality is a controversial subject of great magnitude at the present time. The present allotment is not sufficient to care for the additional work required if these studies are to be made.

(8) \$5,000 for Jerusalem artichoke studies. Experiments should be conducted to determine the best types of Jerusalem artichokes for feed for livestock, for forage for livestock, and for human food. Our knowledge of varieties, the proper soils and fertilizers, and of the internal structure of the artichoke is very limited. The Bureau of Standards desires cooperation relative to the production of levulose.

(9) \$5,000 for studies of variety types of vegetables. This increase is desired for continuing and enlarging the vegetable variety type studies with additional vegetables and in additional sections of the country. The work has just been started; it is of great importance with reference to vegetable varieties, and it has the approval of the American Seed Trade Association.

(10) \$5,000 for production of nursery stock. This increase is desired for furthering the production of domestic nursery stock. Many questions relative to the domestic production of under stocks of fruit plants and roses require thorough investigation. Methods should be determined for propagating ornamental plants in this country in view of the Federal restriction on foreign plant products.

BUREAU OF PLANT INDUSTRY (Continued)Project Statement

<u>Project</u>	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>	<u>Increase</u>
Laboratory of plant pathology	\$ 56,270	\$ 52,180	\$ 52,180	-
Fruit disease investigations	187,418	221,375	236,375	\$15,000 (1-2)
Diseases of vegetables and ornamentals	167,520	166,115	176,115	10,000 (3)
Date culture and breeding	65,200	63,585	68,585	5,000 (4)
Citrus breeding and testing	18,450	30,255	30,255	-
Smyrna fig and crop physiology and breeding investigations	9,766	10,605	10,605	-
Plant physiological investigations	14,806	16,046	16,046	-
Fruit and vegetable handling, transportation and storage investigations	111,287	164,165	164,165	-
Grape production investigations	28,835	31,380	31,380	-
Fruit production investigations	54,498	51,055	72,097	21,042 (6-7)
Fruit improvement through breeding and selection	31,023	32,580	32,580	-
Fruit and vegetable utilization	40,065	35,195	35,195	-
Truck crop production and improvement	60,204	88,105	98,105	10,000 (8-9)
Irish potato investigations	32,595	54,410	54,410	-
Bulb culture investigations , ,	20,919	23,050	23,050	-
Landscape gardening and floriculture investigations	15,252	14,580	14,580	-
Nut investigations	43,044	76,320	112,547	36,227 (5)
Nursery stock investigations	22,322	23,230	28,230	5,000 (10)
Total	\$979,474	\$1,154,731	\$1,257,000	\$102,269

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BUREAU OF PLANT INDUSTRY (Continued)Activities under this Appropriation

The investigations are conducted to determine the best methods of culture, propagation, breeding, selection, disease control and related activities as affecting the most profitable production of fruits, nuts, vegetables, ornamentals, nursery stock and related plants. The interrelation of various orchard practices and problems concerned with the nutrition and physiology of the various horticultural plants are studied. Investigations for determining the best methods of harvesting, packing, shipping, storing and utilizing horticultural products and studies of the physiological and related changes of such products during marketing and storage are also conducted.

Laboratory of Plant Pathology: Investigations include the following:

- A. Research on crown gall. This activity is a study of the segregation of the different types or strains, and a determination of their infectious nature, and other characteristics as organisms.
- b. Research on perennial apple canker. This is an effort to determine whether an organism is the primary cause of this serious disease of apple trees in some parts of the Northwest.
- c. Bacterial canker of tomatoes. The life history of the bacterium which causes this disease and the means by which it lives over winter and becomes disseminated is being studied.
- d. Bacterial blights of beans. Means of dissemination of, and infection by the several bacteria involved are being studied in connection with the working out of control measures of this disease.
- e. Culture media laboratory. The purpose of this laboratory is to maintain a readily available supply of culture media for the scientific workers of the Bureau in their study of the fungi and bacteria.
- f. Bacterial blight of garden peas:
 1. Five different strains of the causal organism have been isolated from as many different localities. These strains are being studied for their cultural characters and their effect on the pea plant. Simple and effective control measures are the objective.
- g. Frozen pack investigations. This line of work covers the investigation of new pathological problems incident to the spoilage of the product resulting from the preservation by freezing of strawberries and other fruits.

BUREAU OF PLANT INDUSTRY (Continued)Fruit Disease Investigations:

The investigations under this project have consisted chiefly of the following:

- a. General orchard diseases. These investigations include studies of various types of winter injuries to fruit trees, cedar rust of apples, the peach yellows group of diseases on peaches and certain other stone fruits, pear blight, apple cankers, and a great variety of minor diseases.
- b. Crown gall studies. Crown gall studies have been directed mainly to the determination of effective and practical means of controlling or preventing this disease particularly on apple nursery stock.
- c. Pecan and other nut diseases. This work is centered on pecan diseases from the U. S. Pecan Disease Field Laboratory, Thomasville, Georgia. Experimental work on pecan scab and spraying has been carried on during the past season in southeastern Louisiana from LaFayette. Future work in this section will center about Robson, near Shreveport, Louisiana, at the new field station at that point.
- d. Phony disease of the peach. This is a seriously destructive, and threatening disease centering in the main in the peach district about Fort Valley, Georgia, and adjacent sections. Infection has been shown to be localized in the roots and to be highly contagious therefrom.
- e. Fruit rots and spots. This class of research consists of a study of the diseases of fruits, particularly after they are picked, including the causes of rotting and spotting of the fruit in transit and storage.
- f. Market pathology. This covers the study of fruit diseases on the terminal markets, the object being to determine the cause and to be able to diagnose all the different causes of disease and spoilage as they appear on fruits on the market.
- g. Perennial apple canker. This research covers a study of the special problem presented by the destructiveness of a new and little known apple canker attacking the orchards in the Hood River Valley, and to some extent in adjacent valleys in Oregon and Washington, including the Wenatchee Valley in the latter state.

BUREAU OF PLANT INDUSTRY (Continued)(t) PHONY PEACH ERADICATION

Appropriation, 1930.....\$85,000
 Budget, 1931..... 85,000

This is a new item providing for continuation of work carried during 1930 under the appropriation "horticultural Crops and Diseases".

Project Statement

<u>Project</u>	<u>Expended,</u> 1929	<u>Estimated,</u> 1930	<u>Estimated,</u> 1931
Phony Peach Eradication.....	\$- - -	\$85,000	\$85,000

Activities under this AppropriationPhony Peach Eradication

In July 1929 the Bureau of Plant Industry, in cooperation with the Georgia State Board of Entomology, began a campaign for the eradication of phony disease of peaches. An infectious condition of the root system resulting in abnormally small and poorly flavored fruit. The State of Georgia is contributing \$25,000 to the campaign during the fiscal year 1930.

Thirty-two inspectors were assigned to this work and during the months of July, August, and September this force inspected 6,605,400 peach trees located in 52 counties in Georgia and marked 51,691 as infected with the phony peach disease., to be removed by digging by the owners.

In Alabama 62 orchards containing 94,800 trees were inspected and 243 were marked phony and are to be removed.

BUREAU OF PLANT INDUSTRY (Continued)(u) GARDENS AND GROUNDS

Appropriation, 1930\$97,740
 Budget, 1931 97,740

Project Statement

<u>Project</u>	<u>Expended,</u> <u>1929</u>	<u>Estimated,</u> <u>1930</u>	<u>Estimated,</u> <u>1931</u>
General Care of Experimental greenhouses and grounds...	\$97,442	\$97,740	\$97,740

Activities under this AppropriationGeneral

A range of thirty-two greenhouses is maintained, providing for the experimental facilities for all of the different divisions of the Bureau. In the greenhouses experimental work with a wide range of plants is carried on, including seed testing, propagation and general hybridization work, and pathological studies. The propagation of plants for ornamenting the grounds of the Department, the lighting of the grounds and the removal of refuse from the buildings is provided for in this item.

General Care of Experimental Greenhouses and Grounds

There is being maintained a range of thirty-two greenhouses by this office for the following work: The inspection and fumigation of plants; the propagation of blueberries and evergreen shrubs; the propagation of resistant chestnut stocks; general hybridization work; seed testing; experimental work with citrus and other tropical fruits; propagation of plants for ornamenting the grounds of the Department and those of the Weather Bureau; the growing of a collection of grape vines for miscellaneous experimental work; experimental work with alfalfa, clover, cowpeas and beans, experimental work with florists' crops, including roses, carnations and chrysanthemums, producing and growing a collection of hybrid amaryllis bulbs; plant breeding work; and the Pathological work of the Bureau. This office also maintains the Department grounds in good condition through the usual method of caring for lawns, mowing, trimming the edges, re-seeding bare spaces and filling in low places; cleaning and sweeping the asphalt roads and walks; planting flowering shrubs and evergreens; removal of dead trees and shrubs, and trimming off dead limbs; planting bedding plants for summer, fall and spring flowering; the lighting of the grounds and removing of refuse from the Department buildings.

BUREAU OF PLANT INDUSTRY (Continued)(Continued from page 166)

- h. Physiological fruit diseases. This research covers a study of a large group of diseases of fruit trees, especially, but to some extent of the fruits themselves, not limited to arid and semiarid America, but much commoner in the western half of the United States.
- i. Orchard spraying experiments. Orchard spraying experiments, including as objectives the control of peach brown-rot and bacterial spots, apple blotch, bitter-rot, and leaf-spot; also, studies of the causal organisms, host relations and improvement in methods of control.
- j. Citrus and subtropical fruit diseases. The project covers the general investigation of various field and transit diseases of citrus fruits, avocados, mangos, pineapples, papayas, figs, Japanese persimmons, olives, dates, etc.
- k. Grape and small fruit diseases, including the following:
 - 1. Cranberry diseases. Chiefly studies of false blossom and fruit rots. The insect carrier of false blossom has been discovered, its distribution mapped, the most susceptible varieties and certain promising resistant wild plants discovered and located;
 - 2. Strawberry diseases. Dwarf and related diseases and root rot of this plant are chiefly studies. These diseases are the cause of heavy losses to the growers.
 - 3. Studies of fungi affecting small fruits. This work represents chiefly the contribution of this office to the Bureau mycological herbarium.
 - 4. Grape diseases. We are at present studying particularly the diseases of grapes incident to the attempted introduction of grape culture into the sand hill regions of North and South Carolina.
 - 5. Blackberry and raspberry diseases. This work is confined chiefly to the virus diseases of these plants, particularly the roguing of commercial varieties and the obtaining of nursery stock. These diseases uncontrolled deplete the plants and greatly reduce yields.

Diseases of Vegetables and Ornamentals:

The investigations under this project have consisted chiefly of the following:

- a. Diseases of ornamentals. This work includes a study of basal rot and mosaic disease of narcissus; mosaic and botrytis disease of tulips; mosaic disease of iris; scab,

BUREAU OF PLANT INDUSTRY (Continued)

bacterial leaf blight and pencillium rot of gladiolus; aster wilt; phlox blight.

b. Diseases of vegetables: - including

Curly top diseases of vegetables. The problem is to determine the symptoms of the disease and losses from the trouble and to develop resistant varieties and other methods of control.

Potato disease studies include investigations of western potato diseases, particularly those that are prevalent in irrigated sections; potato virus disease investigations, conducted especially at Presque Isle, Maine and of which there are several that cause large economic losses; and investigations of potato virus diseases occurring in the Northwest.

- c. Sweetpotato diseases. The objective to determine the relative susceptibility and resistance of seedlings to stem rot and means of control; also storage diseases, the organisms causing same, the conditions under which they occur, and control measures.
- d. Bean diseases. These investigations include the economic aspects of such diseases as blight, rust, mosaic, bald-head, those causing spoilage in transit including the most practicable methods of control.
- e. Cabbage diseases. The development of commercial strains resistant to yellows, a method of controlling club root, the means by which black rot is disseminated, the cause of head rot and how to prevent it.
- f. Onion diseases. Attention is being given to three problems: The prevention of loss in storage from neck rot; the determination of the reasons why colored onions are resistant to smudge and certain other storage diseases; a survey of the occurrence, distribution and destructiveness of yellow dwarf.
- g. Cucurbit diseases. This work concerns mainly diseases of watermelons, muskmelons and cucumbers. With watermelons the problem is the extent and character of the injury caused by chemicals such as fertilizers, residues of which often remain in the cars in which melons are shipped; with muskmelons the studies have to do with such diseases as scab, wilt, fruit rots, leaf spots, and mosaic, their occurrence, methods of overwintering, dissemination, and methods of control; cucumber and muskmelon mosaic control methods are also given attention.
- h. California vegetable diseases. The breeding of muskmelon varieties resistant to powdery mildew, disease resistant celery especially with respect to black heart and heart

BUREAU OF PLANT INDUSTRY (Continued)

rot, and lettuce varieties resistant to disease prevalent in the Imperial Valley such as brown blight and mildew, and the determination of such methods of overwintering and control of certain tomato diseases as dieback, verticillium wilt, late blight and studies on various other diseases comprise the outstanding activities.

- i. Mosaic diseases. Many vegetables are subject to characteristic and serious injury from a group of virus diseases termed "mosaic" diseases. A number of such diseases are being investigated as tomato mosaic, tomato streak, cerery brown stem, lettuce mosaic, and the like.
- j. Vegetable storage diseases. Special attention is given to the sweetpotato, carrot, turnip, pumpkin, onion and onion sets. Because of frequent injury to such vegetables in handling and the development in consequence of diseases in storage, the exact relationship under controlled conditions to wounds, such as cuts, bruises and abrasions to different storage troubles and conditions are studied.
- k. Market vegetable pathology. This work is associated with food products inspection service of the Bureau of Agricultural Economics. Inspectors are given instruction in the identification of vegetable diseases in the markets and those encountered in storage in transit.
- l. Miscellaneous vegetable diseases. This activity is mostly along taxonomic lines and consists of various systematic studies of various genera causing root rots, stem rots and fruit rots of economic plants.

Date culture and breeding:

The purpose of this project is to establish date culture on a satisfactory commercial basis in those regions of the United States where soil and climate are favorable; and to develop by breeding varieties better suited to American conditions than imported sorts. Twenty-five hundred acres, chiefly in the Coachella Valley have been planted to dates, of which 250 acres are in bearing.

Citrus breeding and testing:

The purpose of this project is to develop by breeding new and hardy, as well as disease-resistant, citrus fruits; and to introduce and test out wild relatives of citrus to determine their value for stock or breeding work.

This project also includes the work with boron resistant stocks which has for its purpose the development of stocks for citrus plants able to resist boron injury. The work is to meet a situation which has developed

BUREAU OF PLANT INDUSTRY (Continued)

chiefly in the lemon groves of California.

Smyrna fig and miscellaneous crop physiology and breeding investigations:

This work is devoted to the establishment of the Smyrna fig and postache nut on a commercial scale production in this country; and the testing out of certain Chinese economic plants, etc.

Plant physiological investigations:

- Three lines of work are conducted under this project, namely;
- a. Phytochemical investigations: Phytochemical studies of the waxy coating on the epidermis of apples. The chemical composition of this wax has been fairly accurately determined; the rate of its development under different climatic conditions, as the season advances, is being studied. The practical application of this work is in its relation to apple storage scald. It has been shown that there is probably close correlation between certain constituents of the wax and the development of scald.
 - b. Nitrogen metabolism and protein synthesis of plants. The objectives of these studies are to obtain a background upon which a rational investigation of the many diseases and disturbances of the nitrogen metabolism of crop plants may be based. Thus far the results in part consist of the discovery of the immediate cause of the mosaic disease of spinach and cabbage; new chemical components in certain cereals; a new protein in English rye grass; and the biochemical identification of the organism that causes a certain disease of plum and peach trees. The biochemical effect of fertilizers on peas is being studied.
 - c. Carbohydrate metabolism of plants. These studies include
 1. Changes which take place in flower bulbs as a result of heat treatment necessary for the destruction of insect pests.
 2. A study of the physical and colloidal changes in storage bulbs, roots, and tubers during storage.
 3. A comparison of new procedures for the determination of carbohydrates.

BUREAU OF PLANT INDUSTRY (Continued)

Truck crop production and improvement:

The investigations in these fields are varied:

- a. Cultural practices, management, improvement.
 1. Lettuce breeding to develop heat resistant strains and varieties for eastern conditions.
 2. Peas - The effect of chemical plant foods on composition, culinary quality and food value.
 3. Peanuts - the effect of fertilizers, planting distances, varieties, effect of different treatments of seed on yield, breeding and selection for improved varieties.
 4. Squash - methods of curing and storing in relation to various qualities.
 5. Sweetpotatoes - effect on yield and market value of different planting distances, fertilizers, and seed selection.
- b. Production of vegetables on muck soils - including studies of the response of various crops on such soils to fertilizers, moisture supply including height of water table, and means of protecting against wild damage; also the use of muck soil mixtures for greenhouse purposes, and biometrical of plot size and replication.
- c. Field trials, variety type studies, improvement by breeding and Jerusalem artichokes. Extensive field tests in widely separated places are in progress with peas, tomatoes, and cabbage for the purpose of establishing variety standards and variety descriptions.
 Extensive breeding work with tomatoes is in progress in continuation of work which already has yielded several varieties of decided commercial value and which have largely superseded other varieties in some regions.
Jerusalem artichokes. The scope of the work with this crop includes a test of all procurable varieties for cultural and handling methods, and for varietal descriptions.

Irish potato investigations:

This work includes.

- a. The increase of stock of all promising seedlings now on hand;
- b. A study of the optimum daylight period for tuber development and relative date of maturity of seedlings;
- c. Enlargement of the number of crosses between desirable parental varieties or strains in order to furnish a source of seed supply for the growing of seedlings in other localities not as yet determined upon;
- d. Continuance of chromosome count studies initiated in 1929;

BUREAU OF PLANT INDUSTRY (Continued)

- e. Testing approximately 40 seedling potatoes at Greeley, Colorado; 20 at the Rhode Island Agricultural Experiment Station, and from 3 to 6 seedlings at the New York, Michigan, Wisconsin, Minnesota, North Dakota, Iowa, Nebraska, Montana, Washington, and North Carolina experiment Stations;
- f. The growing of some 8,000 seedlings cooperatively with the Iowa Agricultural Experiment Station for the purpose of producing more desirable commercial varieties of potatoes for the corn belt section;
- g. Plans to improve the seed stock of all varieties and seedlings grown on Aroostook Farm, Maine;
- h. Experimental potato studies under irrigation at Greeley, Colorado, including relation of soil moisture to tuber set; relation of soil moisture to length of tuber stolon; effect of irrigation on seed; seedling tests; distance of planting; selection studies of Triumph and Irish Cobbler; time of planting;
- i. Experimental work at Presque Isle, Maine, other than with seedlings, including tuber index and selection studies with Irish Cobbler, Triumph, and Green Mountain; sprouting experiments; old versus fresh cut seed; fertilizer experiment; fertilizer ratio experiment in cooperation with the office of Soil Fertility, Bureau of Chemistry and Soils;
- j. Experimental potato studies at Arlington Farm, Virginia, and Charleston, South Carolina, including suberization studies of cut sets; suberized versus fresh cut sets; effect of increased application of fertilizer on suberized and fresh cut sets; temperature influence on seed potatoes; temperature influence on rest period and dormancy; tuber curing studies; storage shrinkage; sun-scald studies; fertilizer studies; sprout tuber studies; control studies of the seed corn maggot injury.

Fruit and Vegetable Handling, Transportation and Storage Investigations.

The following investigations are being carried on under this project:

- 1. The Effect of Gases on Fruits and Vegetables.
 - (a) Fruits and vegetables in transit under heater service are frequently exposed to carbon monoxide gas. Tests are being conducted to determine the effect of this gas on the ripening process.
 - (b) The effect of varying concentrations of carbon dioxide gas on fruits and vegetables is being studied. Carbon dioxide gas is formed by fruits and vegetables in storage. Excessive concentrations result in injury to the commodity.
 - (c) The effect of dilute concentrations of ammonia has been determined. Traces of ammonia are sometimes present in cold storage plants.
- 2. Spray Residue Removal. Most of the apples and pears grown in the western and south-central states, and in the southern portion of the eastern apple growing territory are treated in some way before marketing to remove the residue from arsenical spray. Investigations in this connection have included the testing of dry cleaning and chem-

BUREAU OF PLANT INDUSTRY (Continued)

ical cleaning methods, and detailed investigations on the concentrations of solutions, time of exposure, and temperature of solutions in chemical treatments. At least forty thousand carloads of fruit were chemically cleaned this year.

3. Heater Car Investigations. Methods of heating cars of fruits and vegetables while in transit during the severely cold weather are being investigated. The application of sufficient heat to prevent freezing, without overheating in the top of the car, is a very difficult but very important problem.
4. Transportation of Pears. Tests to determine the possibility of heavier loading of pears in refrigerator cars are being made. Heavier loading would reduce the refrigerator charge per box and might result in a reduction in freight rates.
5. Frozen Pack Method of Storing Berries. A large industry in the freezing of fresh berries has developed during recent years. The rate of cooling of berries in different types of packages and the temperatures required for holding are being studied. Types of packages suitable for retail distribution are being given special attention.
6. Storage of Oranges. As a result of the interest in shipping California oranges to Europe it has become necessary to determine the best temperatures for holding oranges under refrigeration. This work is now under way.
7. Storage of Cut Seed Pieces of Potatoes. Potato seed pieces cut and suberized for some days prior to planting are freer from fertilizer injury and from certain insect pests than if cut and planted immediately. Detailed studies to determine the best temperatures and humidity for suberization to occur are being made.
8. Portable Pre-cooling Plants. Studies are being conducted to determine efficiency of fan pre-cooling units placed in the bunkers of refrigerator cars to cool fruits and vegetables in the cars rapidly. Successful types have been developed which result in very rapid cooling of the car contents and much better delivery of the product.
9. Insulated Pony Refrigerators. Improved types of pony refrigerator for handling small lots of fruits have been developed.
10. Ocean Transportation Investigations. Methods of holding and temperatures in transit in Ocean transportation of citrus fruits from California to England, and fresh vegetables from Florida to New York are being studied. Improved methods of handling these commodities are being worked out.

BUREAU OF PLANT INDUSTRY (Continued)Ornamentals and landscape gardening:

The work under this project includes:

- a. Roses. Variety studies, especially with teas, hybrid teas, and climbers are in progress; also breeding to obtain better hardy disease resistant varieties.
- b. Peonies. Variety studies and investigations on depth of planting on both heavy and light soils are being made.
- c. Chrysanthemums. Developing of early flowering hardy sorts for outdoor culture in the north, is in progress with decided accomplishments already attained.
- d. Morning glories. Developing double or tassellated varieties is well advanced.
- e. Carnations. New and very promising varieties have been developed and are being tested before introduction; breeding is still in progress.
- f. General studies on plant material are being made as to its adaptability for ornamental planting and the regions where it is reliable. Publications have been issued on annuals, herbaceous perennials, roses, dahlias, chrysanthemums, iris, day lilies, street trees and roadside trees, as well as the arrangement of plants about the farmstead, along streets and on country roads, and their handling in transplanting and in horticultural exhibitions. Studies are being directed especially to similar studies about vines, hedges, school grounds and rural cemeteries.

Bulb Culture Investigations:

To a considerable extent the object of this work is the establishment of a bulb growing industry, or industries, in this country. Heretofore substantially all of the flowering bulbs used in this country have been imported, particularly the so-called Dutch bulbs, including tulips, hyacinths, and narcissus. Easter lily and various other lily bulbs were also largely imported until recently. A study has been made of the regions adapted to the culture of the various bulbs; also of the relative merits of the home-grown and imported bulbs, both for outdoor planting and for forcing. In addition to work with the bulbs widely known in the trade, the field has offered also a great opportunity for the development of many little known bulbous flowering plants of great potential value and promise. Breeding and hybridizing to produce new types is making material headway.

Grape Production Investigations: There are two principal lines of investigation under this project; namely,

1. Vinifera grapes.

- (a) This work includes comprehensive work on factors effecting yield and quality of vinifera grapes. Studies on pruning and nutritional requirements of grapes are included.
- (b) Stocks which are resistant to phylloxera are becoming more and more essential to the production of vinifera varieties. A complete study of resistant stocks adapted to different varieties and different soils is under way.
- (c) New or little known varieties are being tested out in California and the possibility of growing vinifera varieties in eastern states through using resistant roots is being studied.

2. Muscadine grapes. These grapes are the only ones well adapted to the southeastern states. The development of superior varieties by breeding and working out of improved cultural methods, especially as to training and pruning, and methods of utilization, are the principal lines of work.

Fruit Production Investigations:

1. Tree Fruit Investigations. The following lines of work are included.

- (a) The determination of the type of growth in various tree fruits associated with high production and the cultural methods which will maintain these growth conditions in the orchard.
- (b) The determination of the factors which control color development in apples, and peaches, including especially the relation of fertilizer treatment, light exposure and temperature to color development.
- (c) The determination of the water requirement of fruit trees and the effect of water shortage on size, color and quality of fruit.
- (d) The factors which influence adaptation of fruit varieties to different climatic conditions and the determination of the varieties which are well adapted to different sections of the United States.
- (e) New fruit varieties are studied to determine their merits for different parts of the United States.

2. Small Fruit investigations. This work includes:

- (a) Strawberry breeding. The growing of thousands of hybrids is resulting in the production of new varieties which promise largely to replace those now in commercial use.
- (b) The determination of the time of the formation of flower parts in the strawberry, and the relation of this to the time of application of fertilizers.

BUREAU OF PLANT INDUSTRY (Continued)

- (c) The fundamental factors, including length of day, temperature, etc. which determine the adaptation of strawberry varieties to different portions of the United States.
- (d) A detailed study of the effect of different fertilizers on the shipping quality of strawberries.
- (e) The breeding and selection of raspberries and of blackberries to secure improved varieties from the standpoint of production, hardiness, and quality of fruit.

Fruit Improvement Through Breeding and Selection:

1. Fruit Improvement Through Breeding. The object of this work is the development by breeding of improved fruit varieties. Most of our present commercial varieties originated as chance seedlings. By breeding and selection desirable characteristics of different varieties are combined in single individuals. Hybrid seedlings of peaches, plums, apples, and other fruits which show great commercial promise are now being studied.
2. Fruit Improvement Through Bud Selection.
 - (a) This work is being carried on mainly in the citrus growing districts of California and Arizona. A systematic search is made in commercial orchards for variations which may consist of branches of trees, or whole trees, showing improved quality, size or productiveness of fruit. These improved variations are used for propagation in the production of new trees. Many promising new strains of commercial citrus varieties are being grown as a result of this study. These include a seedless orange, having other valuable characteristics, Washington Navel oranges fruiting throughout the year and showing very heavy production, and Marsh grapefruit producing trees of vigorous growth, early fruiting, heavy production, and superior quality fruit.
 - (b) The work is also demonstrating the presence of unfruitful and undesirable strains of citrus fruits which as a result of this work are largely being eliminated from commercial orchards.
 - (c) This work has recently been extended to include deciduous fruit varieties, particularly peaches, prunes, pears and apricots. Striking variations have been found which are being propagated for further study.

BUREAU OF PLANT INDUSTRY (Continued)Nut Investigations:

This work includes the following:

1. Cultural Investigations.

- (a) A critical study of the commercial merits of almond varieties is being made in California. This includes analysis of hardness, or shell cracking quality, filling of nuts, quality of nuts, and yield, under varying conditions. This study is indicating that many of the present commercial varieties should be eliminated. Breeding work to improve the available almond varieties is under way.
- (b) Studies of pollination requirements of different almond and walnut varieties to insure the setting of full crops on the trees are being made.

2. Pecan Investigations.

- (a) General survey of entire pecan region. A survey is being made covering representative pecan orchards in North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Tennessee, Oklahoma, Arkansas and Texas. Detailed records will be made of the growth conditions in different orchards as correlated to yield of nuts.
- (b) In the Southeast. At Albany, Georgia, a critical study of the relation of tree growth to setting of nuts, the fill of nuts, and the total yield is under way. The effect of cover crops, fertilizers, and moisture supply on the growth of the trees and the production of nuts is being studied. Detailed studies of the root development of pecan trees in different soil types is being continued. A study of the effect of different root stocks on growth and productiveness of the pecan trees is being made.
- (c) In the Southwest. At Shreveport, Louisiana, a pecan field station has been established. Plantings are being made at this station to determine the effect of pruning, pollination, and various types of soil management on the productiveness of pecan trees. Studies in commercial orchards include factors affecting the set of nuts and factors affecting the filling of nuts, and the general productiveness of pecan trees.

3. Nut Investigations in the Northeastern States. A systematic search for promising black walnuts and other nut varieties adapted to the growing region in the northern and eastern states is under way.

4. Nut Research in the Northwest. A survey on the relation of soil and cultural conditions to walnut and filbert production in the Pacific Northwest is now under way. This survey will show the soil types, management, and practices which under commercial conditions are giving best growth and production in that section. Walnut pollination and the relation of moisture supply to the filling of nuts are also being studied.

BUREAU OF PLANT INDUSTRY (Continued)

Nursery Stock Investigations: Work under this project has consisted generally in investigations in the propagation of fruit trees and roses.

1. Apple Stock Investigations. The use of American produced seedlings in comparison with French crab seed and French grown seedlings is being tested. The methods of propagating apple roots vegetatively are being developed and stocks which appear superior are being tested.
2. Cherry Stocks. Comparative merits of Mazzard and Mahaleb stocks for both sweet and sour varieties are being determined. Seed from American sources for cherry propagation have been tested out.
3. Pear Stocks. Use of American produced seed in comparison with French seedling stocks is being tested.
4. Peach Stocks. The resistance of various peach stocks to orchard pests are being determined under California conditions. Resistance of various peach stocks to diseases prevalent in eastern districts are also being determined.
5. Rose Stocks. Methods of producing American grown rose stocks for both outdoor and greenhouse roses are being studied. At the present over ten million rose stocks are used per year, most of which are grown in Europe.
6. Coniferous Ornamentals. A limited amount of work is being done on the propagation of coniferous ornamentals by grafting and cutting.

Fruit and Vegetable Utilization

Several main lines of investigation are in progress as follows:

(1) The fundamental factors involved in the preservation of foods. This includes a study of the physiology and chemistry of spore formation and the factors which control spore formation in bacteria; also the conditions under which spores form. The object is to ascertain the causes of the high resistance of spores to heat under some conditions as related to sterilization of foods in canning. The identical sterilization processes produce different results at different times, presumably because of differences in the resistance of spores to heat.

(2) A study of the causes of corrosion and the perforation of the tin containers by fruits and vegetables. Heavy losses are suffered because of this type of deterioration in the can. The causes of corrosion are being studied. Some of them have been determined. It has been shown

BUREAU OF PLANT INDUSTRY (Continued)

that an increased oxygen and acid content accelerates corrosion and that various other elements in canned products are related thereto. Moreover, it has been found that the fertilizers applied to the growing crops as they affect the chemical contents of the matured crop may also have a direct relationship to corrosion.

(3) Studies of the more important horticultural varieties of fruits and vegetables with reference to their suitability for canning or other horticultural manufacturing purposes. Wide differences have been found in the utilization value of different varieties with respect to the quality of the product as finally prepared. The stage of maturity at which the raw material is utilized is also a factor. Such studies have been made upon sweet potatoes, sweet corn, tomatoes, apples, peaches and work upon grapes, peaches, strawberries and beets is in progress.

(4) Studies of the nutrition of fruits and vegetables as affecting composition and quality of canned products. Results thus far indicate that fertilizer treatments exert decided effects upon chemical composition, flavor and canning quality of certain vegetables.

(5) A study of the bacteriological and microbiological problems arising out of the frozen packing of strawberries and other berries and fruits. The frozen pack industry is encountering considerable losses from spoilage due to bacteria for which no method of prevention is as yet known. In another connection these organisms are being studied and classified. This activity has to do with the application of the knowledge of the organisms to the practical aspects and mechanics of fruit preservation by this method.

(v) ARLINGTON EXPERIMENT FARM

Appropriation, 1930..... \$60,000
Budget, 1931..... 60,000

Project Statement

<u>Project</u>	<u>Expended,</u> <u>1929</u>	<u>Estimated,</u> <u>1930</u>	<u>Estimated,</u> <u>1931</u>
Arlington Experiment Farm.....	\$68,555(a)	\$60,000	\$60,000

(a) Includes transfer of funds to restore buildings damaged by fire.

BUREAU OF PLANT INDUSTRY (Continued)Activities under this AppropriationGeneral

The Arlington Experiment Farm appropriation covers the operation and maintenance of the station, which consists of a highly improved 400 acre tract provided with laboratories, greenhouses, barns, shops, and other buildings numbering sixty-eight in all. The station operates purely as a service branch, mainly of the Bureau of Plant Industry, and furnishes facilities for conducting experiments covering a wide range of research work. There are no important research accomplishments to report, these being financed and reported by the offices which are directly conducting the experiments.

Work under this appropriation includes among other things, the maintenance and repair of the station buildings, the extension and maintenance of the necessary road, heating, water, power, sewer and drainage systems, the replacement as necessary and the maintenance of about forty head of horses and mules, and a fairly complete complement of agricultural implements, tractors, trucks, other vehicles, grading equipment, etc.; the maintenance and improvement of soil fertility, maintenance of the grounds consisting of several acres of lawn with collections of trees, shrubs and other ornamentals, the maintenance of a watch force, account keeping of services rendered and material furnished other offices and bureaus; the general supervision of the work of the station itself, the erection of new buildings, and much of that performed for other offices and bureaus upon a reimbursement basis.

Facilities at the Arlington Farm are also used for important research work of the Bureaus of Chemistry and Soils, Public Roads, and other branches.

(w) FOREIGN PLANT INTRODUCTION

Appropriation, 1930:

Facial.	\$203,200
Balance available, 1930, for wilt-resistant alfalfa provided by Second Deficiency Act, 1929.	7,500
Total available, 1930	210,700
Budget, 1931.	222,000
Actual increase	11,300
(Apparent increase	18,800)

The increase of \$11,300 is submitted for the following purpose:

1. \$7,300 for the introduction of wild potatoes from South America for use in breeding disease-resistant varieties. Potato breeders of this bureau and of the State Experiment stations are of the opinion that a study is needed to the native wild types in their countries of origin, as well as

BUREAU OF PLANT INDUSTRY (Continued)

their introduction into the United States for breeding. The work has been urged by the potato growers, breeders and research workers of the Middle West and East.

2. \$4,000 for Bell and Beltsville Stations. To be used to make the necessary changes in growth to care for the increased facilities required for detention and isolation, such as repairs to heating system, installation of propagating benches, etc.

Project Statement

<u>Project</u>	<u>Expended,</u> <u>1929</u>	<u>Estimated,</u> <u>1930</u>	<u>Estimated,</u> <u>1931</u>	<u>Increase</u>
Foreign explorations.	\$28,230	\$38,170	\$45,470	\$7,300(1)
Experimenters' Service:				
Washington, D. C.	59,507	60,617	60,617	- - -
Bell, Maryland.	43,270	39,749	43,749	4,000
Bellingham, Washington.	4,070	2,035	2,035	- - -
Chapman Field, Florida.	22,398	21,703	21,703	- - -
Chico, California.	30,063	26,436	26,436	- - -
Savannah, Georgia.	13,514	13,762	13,762	- - -
Total, Experimenters' Service	<u>172,822</u>	<u>164,302</u>	<u>168,302</u>	<u>4,000(2)</u>
Plant Geography	8,578	8,228	8,228	- - -
Total.	<u>209,630</u>	<u>210,700</u>	<u>222,000</u>	<u>11,300</u>

Activities under this AppropriationGeneral

By means of a system of cooperative contacts maintained with institutions and individuals in all parts of the world, and to a limited extent by special explorations, plant material is imported and tested out, at the stations of the Department, by State and other institutions and by individual cooperators, with a view to finding and establishing in the United States new and valuable economic crops and ornamentals.

Investigations are carried on of plant geography and crop distribution and their relation to climatic and soil conditions, and studies are made of the important problems in plant production from a geographical point of view.

1. Foreign Explorations:

- a. Orient - Initiated March 1929. Further exploration for soybean varieties to expand the area in which this crop can be grown in the United States, both for agricultural and industrial uses. The present area is now 1,500,000 acres with a total crop value between \$25,000,000 and \$30,000,000.
- b. Exploration for legumes for the Atlantic and Southern States.

BUREAU OF PLANT INDUSTRY (Continued)

- c. Exploration for hardy fruits and ornamentals for northern states, especially the Northern Great Plains area.
- d. Turkestan and Persia - initiated June 1929.
 - (1) Study of native alfalfa to secure wilt-resistant strains for the principal alfalfa regions of the United States.
 - (2) Search for hardy fruits for stocks and breeding.
 - (3) A collection of extensive varieties of melons and other cucurbits for increasing varieties in season in this country and for breeding disease-resistant types.
 - (4) A collection of large-fruited pistache nut types for the Southwest.
- e. Madagascar - completed November 1928.
 - (1) Introduction of important rubber plant, Euphorbia intisy, for possible use in the Southwest and tropical possessions of the United States.
 - (2) Introduction of succulent ornamentals for the South and Southwest.
- f. Canada - (conducted under Plant Geography project).
 - (1) A collection of hardy, wild fruits and berries for breeding of cold resistant types.
 - (2) A collection of hardy, wild ornamentals for use in Central and Northern Great Plains area.
- g. New Guinea. While not carried out by this office or financed by it, the foreign expedition for sugar cane types for breeding disease resistance resulted also in the introduction of other plants, particularly ornamentals.
- h. Foreign Activities other than by Expedition. In addition to the activities of agricultural explorers, other activities under this item included the securing by purchase and exchange of quantities of plant material for use by the various investigators of the Department of Agriculture and State Stations.
- i. Important Introductions - The important introductions for the year which cleared through the agency of the Office of Foreign

BUREAU OF PLANT INDUSTRY (Continued)

Plant Introduction, chosen from the 3,550 (B.P.I. Nos. 77281-80810), are particularly:

- (1) The large collection of sugar cane brought in from New Guinea;
- (2) Two collections of Australian ornamentals;
- (3) The plants collected in Madagascar, especially *Euphorbia* *intisy*, and the ornamental succulents;
- (4) The chestnut and *Castanopsis* collection to be used in studying disease resistant varieties and possible sources of tannin material sent in from Japan, together with
- (5) Minor collections of persimmons and various ornamentals, particularly azaleas;
- (6) A large collection of rice varieties from China;
- (7) Collection of soybean varieties.

2. Experimenters' Service. Experimenters' Service has been organized so that material is sent to experiment stations, nurserymen, botanic gardens, parks, plant breeders and accredited amateurs. The material is distributed with the intent that it shall be tested for hardiness and desirability and shall be repropagated by the qualified experimenter for further distribution and establishment in American trade.

a. Washington, D. C.

- (1) Planning and equipping foreign agricultural exploration expeditions.
- (2) Securing through purchase and exchange of desirable seeds and plants from foreign countries desired by research workers of the United States.
- (3) Receiving and handling of all foreign plant material for the Bureau of Plant Industry.
- (4) Growing and propagation of certain plant material in quarantine houses in Washington.
- (5) Shipment of all foreign plant material for the Bureau of Plant Industry.
- (6) Maintaining seed collections, photographic and motion picture film files dealing with plant introductions.
- (7) Planning and carrying out tests of newly introduced plants in cooperation with Department specialists, State Experiment Station, Botanic Gardens, and similar research agencies.

b. Bell, Maryland.

- (1) The major activities at Bell for the year have been to assemble and propagate for testing, preliminary to placing with experimenters, a large variety of ornamental families, particularly azalea, rhododendron, erica, escallonia, ceanothus,

BUREAU OF PLANT INDUSTRY (Continued)

buxus, philadelphus, deutzia, ilex, cytissus, and ligustrum. These have been assembled with the intention of making family surveys before dissemination. This practice of making a family survey before placing materials with experimenters is considered a distinct advantage over a miscellaneous collection.

c. Bellingham, Washington.

- (1) This project is carried by the Office of Horticultural Crops and Diseases (See Bulb Culture)

d. Chapman Field, Florida.

- (1) The work at Chapman Field has been upon rather general lines looking to the introduction of subtropical and, to a smaller degree, tropical plants which will be useful particularly in the Gulf States. The most important work at the station probably is the increase in the number of avocado and mango varieties.

e. Chico, California.

- (1) The three principal activities at Chico can be grouped under the heads of deciduous fruits, bamboos, and chestnuts. The distribution of deciduous fruits, including particularly peaches and nectarines, reached a total of approximately 7,000. Bamboos are of the same varieties that were sent out from Savannah, Ga., and numbered 5,000 plants. The chestnuts, particularly *Castanea mollissima*, were sent out from Chico as the western center in the effort to find a chestnut in this country which would take the place in part of the American chestnut, both as a source of nuts and of tannin-producing material.

f. Savannah, Georgia.

- (1) The entire work at Savannah has centered during the year on the sending out of the giant timber bamboo and the stake and forage bamboos. Of the former approximately 10,000 plants were sent out and of the latter approximately 12,000, with the result that we shall be able to conclude the placing of the first species after the season of 1929-1930 has been completed.

3. Plant Geography.

- g. A study of northern Canada as a possible future field for exploration for hardy plants was initiated and completed during the summer of 1929. Desirable wild types of fruits and ornamentals were secured as indicated previously.
- h. A comparative study, from the point of view of plant life and geographical features, of the principal regions of the United States and corresponding areas of the world as a basis for foreign plant introduction.

BUREAU OF PLANT INDUSTRY (Continued)(x) FORAGE CROPS AND DISEASES.

Appropriation, 1930\$205,000
 Budget, 1931 215,000
 Increase\$ 10,000

The increase of \$10,000 is submitted for the following purposes:

(1) \$10,000 for experiments on northern pastures. - Pasture investigations have been started in cooperation with the Pennsylvania and Michigan Experiment Stations in the north, and with the South Carolina, Florida, and Georgia stations in the south. There is urgent need for the extension of this work especially in the New England States, the Corn Belt and in the Northwest. There is a constantly increasing demand for information relative to grazing. These requests come from all sections since agricultural interests are waking up to the fact that the economical production of beef and milk depends primarily on good pasture.

Project Statement

<u>Project</u>	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>	<u>Increase</u>
Alfalfa investigations	\$ 40,941	\$ 55,559	\$ 55,559	-
Clovers and miscellaneous legumes	51,265	54,929	54,929	-
Soybeans	24,133	24,208	24,208	-
Sorghums	11,634	11,669	11,669	-
Pastures, ranges & grasses	36,218	36,293	46,293	10,000 (1)
Forage diseases	14,623	14,900	14,900	-
Fine turf	<u>7,382</u>	<u>7,442</u>	<u>7,442</u>	<u>-</u>
Total	\$186,196	\$ 205,000	\$215,000	\$10,000

Activities under this Appropriation:General

Field studies are conducted throughout the United States, and cooperative relations are maintained with nearly all of the State experiment stations and the insular experiment stations, pertaining to the production, improvement and control of diseases of all crop plants used for forage either as hay, fodder, silage, or pasture, and incidentally of all plants used for green manuring, turf production, and soil binding.

BUREAU OF PLANT INDUSTRY (Continued)Alfalfa Investigations:

The first problems under investigation are the result of the partial failure of alfalfa in different sections of the United States. This condition in Nebraska and Kansas, which states have long been the center of alfalfa production, has resulted in the actual decrease of alfalfa production in these states. Other localities are having similar trouble.

The investigations cover the following:

(1) Cause and remedies for alfalfa failure in the Middle Western States, which embrace determining the results of the use of non-hardy strains or varieties, developing the strains or varieties resisting the bacterial wilt, effect of cultural methods, effect of depletion of soil fertility, relation of productivity to the soil moisture, effect of frequency and time of cuttings on yields and longevity of stems.

(2) Causes and remedies for alfalfa failure on the black lands of Alabama and Mississippi, embracing value and adaptation of different varieties, cultural methods, time and method of seeding, effect of soil amendments, such as commercial fertilizers and barnyard manure, effect of the addition of humus by plowing under a green manure crop, presence and control of diseases.

(3) Alfalfa failure in the Mississippi Delta. A study of the cause for the frequent failure of alfalfa on the delta lands which would seem well adapted to this culture but on which so far good stands have not been secured. A study is being made of soil conditions, fertilizers, varieties and diseases.

CLOVER AND MISCELLANEOUS LEGUMES.Red Clover and Miscellaneous Legumes:

The lines of investigations with red clover are principally:

- (1) Tests of imported and domestic strains.
- (2) Selections of improved strains.
- (3) Development of red clover seed production in the intermountain states.
- (4) Increasing seed production of special strains of red clover in other localities.
- (5) A study of red clover diseases and disease resistance.

Other legumes studied are zigzag clover, shaftal or Persian clover, Trifolium parviflorum, Korean, Kobe and other Lespedezas, white clover and crimson clover and various other legumes.

BUREAU OF PLANT INDUSTRY (Continued)SOYBEANS, COWPEAS, VELVET BEANS, ETC.

Soybeans:- The work is confined chiefly to the following

- (1) Testing new introductions.
- (2) Breeding new strains adapted to local conditions and various uses and encouraging quality production of the seed of these new varieties.
- (3) Developing improved cultural and harvesting methods.
- (4) Investigation of methods of utilizing the soybean.

Cowpeas:- This crop is being replaced to a considerable extent by the soybean, but it is still grown on large acreages and the office is developing improved disease-resistant varieties by selection and breeding and by the importation of new varieties.

Velvet Beans:- The demand for a white-seeded bush type of velvet beans is about to be satisfied by selections made at McNeill, Mississippi, and Monetta, South Carolina.

There are several other forage and cover crops being studied such as mung beans, Kudzu, and crotalarias.

GRASSES

The lines of work under this project are:

- (1) Introduction and testing of foreign grasses. Many grasses obtained in the exploration work of the Office of Foreign Plant Introduction and by correspondence are being tested to determine their value, particularly in the Southern States.
- (2) Timothy breeding and morphology studies. This work is centralized at North Ridgeville, Ohio. Several improved strains of timothy have been developed at this station, but difficulty is encountered in establishing them commercially, owing to the lack of facilities for increasing the seed.

PASTURES AND RANGES

Popular interest in improved pastures and methods of establishing them is increasing each year. To meet the constant demand for information, actual

BUREAU OF PLANT INDUSTRY (Continued)

grazing experiments are under way at several points in cooperation with the State Experiment Stations and the Bureau of Animal Industry and Bureau of Dairy Industry, U. S. Department of Agriculture. These investigations are carried on in the cut-over region of the Coastal Plain, the pasture-lands of the north-eastern States, and the ranges of the Western States:

- (1) Determining the carrying capacity or productiveness of standard pasture grasses or mixtures of these grasses and legumes.
- (2) The value of fertilizer applications on pastures.
- (3) Methods of grazing experiments to determine the value of alternate as compared with continuous grazing are in progress.
- (4) Comparison of temporary with permanent pastures.
- (5) Composition of pasture plants.

SORGHUM INVESTIGATIONS.

This work is of particular benefit to the Plains region and the Southeast and the Southwest and the lines of investigation are:

- (1) Testing of standard varieties and new introductions.
- (2) Production of improved varieties by selection and hybridization.
- (3) Seed treatment for disease prevention and increased germination.
- (4) Classification of sorghum varieties.

SWEET CLOVER INVESTIGATIONS.

The acreage of sweet clover in the United States has increased from a few thousand fifteen years ago to more than five million in 1928. Sweet clover investigations have had to do principally with cultural problems involved in the introduction of a new crop over a wide territory. In the Middle West and North-central States:

- (1) Cultural experiments with sweet clover, embracing the effect of date and method of seeding, substitutes for lime, the control of winterkilling and the control of sweet clover diseases.
- (2) Breeding and selection work.
- (3) Pasture investigations.
- (4) Silage investigations.

BUREAU OF PLANT INDUSTRY (Continued)FINE TURF INVESTIGATIONS.

Studies of turf grasses have been under way for some years, principally with the idea of developing better turf grasses for use on golf courses and lawns. There has recently developed a need for turf which will endure the hard usage which turf receives on the landing fields of airports. These turf investigations are conducted in cooperation with the United States Golf Association:

- (1) Selection of promising strains of the bent grasses.
- (2) The control of turf diseases.
- (3) Development of seed supply of selected strains of bent.
- (4) Control of insects injurious to turf.

DISEASE INVESTIGATIONS.

The laboratory work in disease investigations is being done principally at Madison, Wisconsin, and Riverside, California. The work in this field is confined principally to a study of alfalfa disease. The pathologists assist, in identifying and suggesting remedies for diseases of other forage crops:

- (1) Determination or identification of the disease organism.
- (2) Field experiments in the development of methods of disease control.
- (3) The importation and testing of alfalfas from foreign lands where they have perhaps already developed resistance to certain alfalfa diseases.

(y) BIOPHYSICAL LABORATORY

For biophysical investigations in connection with the various lines of work herein authorized.

Appropriation, 1930..... \$36,000
 Budget, 1931..... 36,000

Project Statement

<u>Project</u>	<u>Expended,</u> <u>1929</u>	<u>Estimated,</u> <u>1930</u>	<u>Estimated,</u> <u>1931</u>
Investigation of the mechanism of heredity and the factors influencing plant growth.....	\$36,952	\$36,000	\$36,000

BUREAU OF PLANT INDUSTRY (Continued)Activities under this AppropriationGeneral

Field and laboratory investigations are carried on upon the growth and reproduction of various crop plants with especial reference to the influence of physical conditions such as heat, light, moisture and electric currents.

1. Genetics. The genetic studies have as their aim a better understanding of the laws and principles that govern the art of plant breeding. The results to date have in a large measure replaced chance and rule of thumb methods with definite knowledge of how to proceed and what is to be expected.

2. Cytology. This work involves the study of the cells of crop plants and their wild relatives with high-powered microscopes. The number and behavior of the minute bodies, called chromosomes, that carry the plant characteristics from one generation to the next, have explained why certain crosses can be made and others can not, why some crosses are sterile and others fertile.

3. Paper Mulch Investigations. It has been demonstrated that paper mulch stimulates plant growth under a great variety of conditions and with most of the crop plants. The problem now is to determine whether covering the ground with an impervious paper is economically profitable. In the field the work involves experiments in the technic of applying the paper, the relative durability and cost of the various types of paper, and the response of the several crops under different conditions.

In the laboratory the nature of the response to paper mulch is being investigated under controlled conditions.

4. Soil Atmosphere Investigations. Laboratory experiments with paper mulch indicate that the growth of plants is profoundly influenced by changes in the composition of soil atmosphere. Paper mulch is one way of controlling the composition of the soil atmosphere and experiments are being conducted to accomplish the same results by other means.

5. A shop is maintained that supplies soil sampling equipment, repairs meteorological apparatus and designs and constructs special instruments for this and other offices of the Bureau.

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Note.--Also see Miscellaneous Section for "Special Corn Borer Research," "Leaf Hopper and Curly-Top Research," and "National Arboretum."

FOREST SERVICE(a) GENERAL ADMINISTRATIVE EXPENSES

Appropriation, 1930 \$362,230
 Budget, 1931 362,230

Project Statement

<u>Project</u>	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>
General Administration	\$363,758	\$362,230	\$362,230

Activities under this Appropriation

This appropriation provides salaries and expenses of employees engaged on general administrative and service-wide sub-technical activities.

(b) PROTECTION AND ADMINISTRATION, NATIONAL FORESTS

Appropriation, 1930 \$6,703,000
 Budget, 1931 6,985,000
 Increase 282,000

The increase of \$282,000 is submitted for the following purposes:

(1) \$183,500 for additional guards and equipment for prevention of forest fires: Despite the betterments of recent years in organization, training, personnel management, financial management, and all the technique on which fire protection depends, the losses on the National Forests remain wholly incompatible with the redemption of the Federal Government's responsibility for the protection of these vast public properties. Average annual losses of gross area within the National Forests by five year periods are as follows:

1910 to 1914, inclusive	.75%
1915 to 1919, "	.60%
1920 to 1924, "	.27%
1925 to 1929, "	.31%

Each of these five year periods includes one or more of the extreme seasons in which the bulk of the fire losses occur. The record expressed in this way averages good seasons with bad for each five year period and it is a fair measure of what has been accomplished. There has been a steady record of progress until the last five year period. The curve of progress has not been reversed and losses are going up.

It is impossible to convey by figures the nature and extent of these losses from fire. Those who have seen some of the regions affected know what these losses mean in terms of merchantable timber converted into worthless skeletons of trees, young tree growth destroyed, and watersheds ruined. The area of idle land on the National Forests is increasing for lack of a protection effort adequate to meet the danger resulting from an accumulative shortage of precipitation in recent years and the rapidly increasing industrial and other uses of the National Forests.

The nature of the past costly and destructive season was recognized well in advance. Responsible officers went as far as practicable under the existing financial limitations to strengthen their organizations in order to cope with the situation; but the utmost they could do was inadequate.

The number of emergency guards required by the nature of the season could not be employed and distributed over the forests so as to catch fires while small, which is the only time at which they can be handled cheaply and satisfactorily. Funds were lacking to purchase the number of pack animals and trucks required for prompt transportation of fire fighters. Water using equipment in the form of tanks mounted on heavy trucks or portable power pumps with hose had not been provided in anything like an adequate number. The supply of hand tools, mess outfits and numerous articles of equipment gave out at many places.

The result was an extreme expenditure for fighting large fires and vast areas burned which had been successfully protected during previous years. Nothing is gained by a scale of expenditure which is adequate for easy or average fire years if the results of such work and expenditures are to be swept away in the extreme fire years which experience has shown are bound to occur intermittently.

To meet the fire problems on the National Forests requires a balanced program which includes development of the technique of protection, construction of additional improvements, increased effort to prevent carelessness and the starting of man-caused fires, the employment of additional fire guards and the purchase of larger quantities of protection equipment.

(2) \$20,500 for commercial timber sales. This represents an increase of slightly less than two per cent in the total cost of administering the timber sale business on the National Forests. For the fiscal year 1929 timber sale receipts were \$4,049,473.20, or \$786,966.69 greater than for the fiscal year 1928. This is an increase of about 24 per cent. It represents a corresponding increase in the work of marking and scaling timber and of enforcing contracts. This increased work has been handled with the greatest difficulty, and only by postponing other urgently needed work. Further increases are anticipated in future fiscal years, but additional appropriations are necessary if the business is to be undertaken. The requested appropriation increase of \$20,500 represents an increase of approximately two per cent in the cost of handling commercial timber sales, as contrasted with average annual increases in receipts of between 8 and 10 per cent over a long period of years. If additional funds are not provided for this activity it will become necessary to reject applications for the purchase of timber on the National Forests.

(3) \$50,000 for control of tree-destroying insects, rodents, and tree diseases, as follows:

(a) \$25,000 for insect control. Under the existing appropriation, a fund of \$75,000 is set aside for special allotments to combat epidemics of tree-destroying insects in stands of valuable timber. This is insufficient to enable the Forest Service to do the necessary work on all of the more important epidemics or to take the necessary action to prevent, in all cases, the development of epidemics by attacking them in their incipency. In the present year funds were insufficient to do urgently needed work in Montana, Washington, Oregon, California and Idaho. An increase is urgently needed both to prevent the loss

FOREST SERVICE (Continued)

of millions of feet of Government-owned timber and to prevent the development of bad fire hazards, since the bug-killed trees, even in small groups, add greatly to the difficulty of suppressing fires, and when large areas are swept by beetle epidemics, as in Montana, the areas of dead timber remain for many years as an excessive fire danger. The distribution of effort in the fiscal year 1931 can not be determined in advance, because some infestations develop and other decrease during each year, but the experience of years has shown that an increase in the amount requested is necessary if the work which urgently needs doing is to be done. If this increase is not allowed the Forest Service will be unable to finance the conservative program of protection of National Forest timber from insect depredations which is advised by the experts of the Bureau of Entomology.

(b) \$25,000 for control of white pine blister rust. Very little work is now being done to combat dangerous tree diseases, due to lack of funds. The presence of the white pine blister rust within the National Forests of North Idaho, however, makes necessary the protection of the valuable white pine on the National Forest lands in this region or the abandonment of any attempt to grow this species, which is by far the most valuable component of the stand. Protection can be given by destroying the wild currant and gooseberry bushes on which the disease is dependent during part of its life cycle. Practicable methods of destroying these alternate hosts have been developed and demonstrated by the Bureau of Plant Industry. A program for eradicating these bushes from approximately 1,500,000 acres of National Forest land in North Idaho and immediately adjacent portions of Montana and Washington has been carefully worked out in accordance with the advice of the Bureau of Plant Industry. Work under this program should begin at once, since every year will see the further spread of the disease and the hopeless infection of more areas of the valuable white pine. Further investigations and experiments by the Bureau of Plant Industry may produce cheaper methods of doing the work, and full advantage of any opportunities to reduce costs will be taken. The alternative to starting the work promptly is to abandon all attempts to grow white pine on these areas, which will mean the production of inferior species which, at the present time, are worth logging only under very exceptional conditions of accessibility, and will probably always be worth much less than white pine per unit of volume. The lumbering industry of the region is now based largely on the production of pine lumber and could not continue without this valuable wood. Further delay would mean the loss of valuable National Forest property which should be and can be protected and heavy future loss to the industries and communities of the region.

(4) \$3,000 for the regulation of use of grazing lands. This increase will be used to remove trespassing horses from National Forest ranges. It is estimated that 18,000 wild horses trespassed on the National Forests last year, and that approximately \$20,000 per year would be received in increased grazing fees if gentle domestic livestock could take the place of the trespassing animals. The clearing of the range of this nuisance is absolutely necessary to proper grazing administration. Without this increase steps can not be taken which are necessary for reasonably good management and utilization of the National ranges. Increased grazing fees now required of livestock owners strengthen the Government's obligation to eliminate, insofar as practicable, the handicaps to good range management.

(5) \$20,000 for administration of new forest units. The purchase of land is steadily going forward under the Weeks Act as amended by the Clarke-

FOREST SERVICE (Continued)

McNary Act, but the purposes of these acts are frustrated and the expected public benefits will not follow unless the areas are placed under administration and protection as purchased. Purchase of such land is the first step in a program of watershed protection and rational management of such areas but it is only the first step. Purchase should be followed by the employment of forest supervisors, rangers, clerks, and fire guards and the construction of necessary improvements and purchase of working equipment. If this is not done the land remains unprotected and the investment of Federal funds in such land suffers an unbusinesslike neglect.

Where a National Forest has already been established, improvements constructed and necessary personnel employed, the purchase of land usually does not require additional appropriations for protection and administration but this is not true when new units are established. Unless additional funds are appropriated for entirely new units they must go uncared for or the protection and administration of existing units must be weakened to supply a makeshift organization for the new units. During the fiscal year 1930 such makeshift arrangements have had to be resorted to on a number of new ranger districts and National Forests.

The distribution of the \$282,000 increase to National Forest Districts is given below:

To National Forest District No. 1:

Prevention of forest fires	\$45,000
Control of tree-destroying insects, rodents, and tree diseases	35,000
Regulation of use of grazing lands	500
Total	<u>80,500</u>

To National Forest District No. 2:

Regulation of use of grazing lands	\$ 500
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To National Forest District No. 3:

Regulation of use of grazing lands	\$ 1,000
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To National Forest District No. 4:

Control of tree-destroying insects, rodents, and tree diseases	\$5,000
Regulation of use of grazing lands	<u>1,000</u>
Total	6,000

To National Forest District No. 5:

Prevention of forest fires	\$68,500
Commercial timber sales	<u>3,000</u>
Total	71,500

FOREST SERVICE (Continued)To National Forest District No. 6:

Prevention of forest fires	\$45,000
Commercial timber sales.	10,000
Control of tree-destroying insects, rodents, and tree diseases	<u>10,000</u>
Total	65,000

To National Forest District No. 7:

Prevention of forest fires	20,000
Commercial timber sales.	2,500
Administration of new units.	<u>10,000</u>
Total	32,500

To National Forest District No. 9:

Prevention of forest fires	10,000
Commercial timber sales.	5,000
Administration of new units.	<u>10,000</u>
Total.	<u>25,000</u>

PROJECT STATEMENT

<u>Project</u>	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>	<u>Increase</u>
Prevention of forest fires . . .	\$1,790,468	\$1,855,000	\$2,043,500	\$188,500 (1)
Suppression of forest fires. . .	242,403	243,000	243,000	--
Construction of roads, trails, telephone lines, lookout structures, dwellings, etc. . .	686,145	686,000	686,000	--
Maintenance of roads, trails, tele- phone lines, lookout structures, etc.	597,454	597,000	597,000	--
Commercial timber sales.	1,000,773	1,004,000	1,024,500	20,500 (2)
Timber sales made to settlers and farmers for domestic use .	55,453	55,000	55,000	--
Development of forestry practice and support of such practice out- side the National Forests. . .	54,360	54,000	54,000	--
Exploration, location, cruising, and mapping of National Forest timber resources as a basis for management plans and as a neces- sary preliminary to timber-sale programs and policies.	200,175	200,000	200,000	--
Reforestation by planting of National Forest areas	58,506	59,000	59,000	--
Enforcement of provisions of con- tracts covering removal of timber for which no payment is made. .	13,989	14,000	14,000	--

FOREST SERVICE (Continued)

PROJECT STATEMENT (Continued)

<u>Project</u>	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>	<u>Increase</u>
Control of tree-destroying insects, rodents, and tree diseases	\$127,709	\$128,000	\$178,000	\$50,000(3)
Investigations in silviculture and forest products.	45,754	46,000	46,000	--
Regulation of use of grazing lands.	973,103	973,000	976,000	3,000(4)
Determination of grazing capacity of the range and the preparation and application of plans for grazing management, range development, and improvement.	74,029	74,000	74,000	--
Scientific range investigations .	28,530	28,000	28,000	--
Development of fish and game resources, and game law enforcement activities.	113,470	113,000	113,000	--
Management of agricultural settlement under Federal homestead act and claims under various public land laws.	67,277	67,000	67,000	--
Location, survey, and appraisal of lands to be purchased or acquired by exchange	85,709	86,000	86,000	--
Regulation of private occupancy of National Forest land for all purposes other than timber and grazing	177,566	178,000	178,000	--
Surveying and mapping National Forest lands for general purposes.	162,247	162,000	162,000	--
Appraisal of recreational resources of National Forest lands and preparation of work plans.	64,728	65,000	65,000	--
Boat for Alaska National Forest District	--	16,000	16,000	--
Administration of new units	--	--	20,000	20,000(5)
Total.	\$6,619,850	\$6,703,000	\$6,985,000	\$282,000

Activities under this AppropriationGeneral

This appropriation is used for the general operating expenses of the National Forests and National Forest District Offices, including the follow-

FOREST SERVICE (Continued)

ing items:

(1) Salaries and travel expenses of the men in charge of the various units of organization such as National Forest Districts, National Forests and Ranger districts. There are now nine National Forest Districts, 146 National Forests and 758 Ranger districts. These men direct the administrative, protective and improvement activities carried on in the units for which they individually are responsible and during the course of a year will devote varying portions of their time to practically all of the projects listed in the statement which precedes this paragraph. For some of the projects worked on and supervised there are special appropriations, but the salaries and, except under certain special conditions, the travel expenses of the men in charge of administrative units are paid entirely from this appropriation. It would be impossible to exert financial control over the many general and special appropriations if an attempt were made to pay the salaries and expenses of men in charge of physical units from special appropriations in proportion to the varying amounts of time spent on the different projects. This method of financial management accounts for a large part of the charges from this appropriation to projects for which there are special appropriations.

(2) Salaries and expenses of the assistants to these supervisory officers including the salaries of clerical employees. Exceptions are that when such an assistant or clerk is wholly employed on an activity such as tree planting or road construction, for which a special appropriation is available, his salary and any necessary travel expense is paid from the special appropriation; also when the time of an assistant is divided between work for which there is no special appropriation and work for which there is a special appropriation in a way which calls for adjustment as a matter of law and fairness between appropriations, the cost of his time and travel expense, if any, is so divided. Such adjustments are controlled by instructions which are based on the related Acts of Congress, and policies and purposes of Congress and the Bureau of the Budget and the Secretary of Agriculture.

(3) Salaries of fire guards, scalers and other short-term employees engaged on work for which there is no special appropriation. Twenty-eight hundred fire guards are employed as required by the fire danger in each locality. Periods of employment vary from one to six months and average about three months.

FOREST SERVICE (Continued)

When such work as building or fence construction is needed at the station of a fire guard he is employed on such work if arrangements can be made so that he can be called by telephone when a fire is discovered. Also, if periods of wet weather occur during the fire season, fire guards are used so far as possible on any other work needed, such as improvement work of all kinds. In both of such instances the guard is paid from the special appropriation if funds are available. If the special appropriation concerned is exhausted the guard is nevertheless used on the special work as a matter of good business management, but his wages are paid from the Protection and Administration appropriation which is used while the man is required for straight fire duty.

(4) Pay of emergency guards. Fire seasons vary greatly in intensity and there are wide variations of fire danger within the limits of a single season. At times of extreme danger the force of 2,800 regular fireguards needs to be increased heavily by the employment of emergency guards who are normally taken from road and trail crews and assigned to fire stations from which they can discover and reach fires most effectively. Beginning with the fiscal year 1929 all emergency guard needs must be met from the Protection and Administration appropriation. At the beginning of the fiscal year a reserve is set up equal to the average expenditure for emergency guards. This sum was wholly inadequate for the season of 1929.

(5) Fire protection equipment is purchased from this appropriation and the appropriation for equipment and supplies to the extent that funds can be made available therefrom.

(6) Miscellaneous costs of operation such as rent of offices, telephone and telegraph tolls, freight, express, supplies and equipment not provided by special appropriations.

The activities provided for wholly out of this appropriation include the following:

- Prevention of Forest fires.
- Commercial timber sales.
- Timber sales made to settlers and farmers for domestic use.
- Development of forestry practice and support of such practice outside the National Forests.
- Enforcement of provisions of contracts covering removal of timber for which no payment is made.
- Control and extermination of tree destroying insects, rodents, and tree diseases.

FOREST SERVICE (Continued)

Regulation of the use of grazing lands.
 Development of fish and game resources and
 game law enforcement activities.
 Regulation of private occupancy of National
 Forest lands for all purposes other than
 timber and grazing.
 Surveying and mapping of National Forest lands
 for general purposes.
 Appraisal of recreational resources of National
 Forest lands and preparation of work plans.

The activities listed in the project statement for this appropriation, for which there are also specific appropriations, are given below:

Suppression of Forest fires.
 Construction of roads, trails, telephone lines,
 lookout structures, dwellings, et cetera.
 Maintenance of roads, trails, telephone lines,
 lookout structures, et cetera.
 Exploration, location, cruising, and mapping of
 National Forest timber resources as a basis
 for maintenance plans, and as a necessary pre-
 liminary to timber sales program and policy.
 Reforestation by planting on National Forest
 area.
 Investigation in silviculture and forest products.
 Determination of grazing capacity of the range
 and the preparation and application of plans
 for grazing management, range development and
 improvement.
 Scientific range investigation.
 Management of agricultural settlement under
 Federal homestead act and claims under various
 public land laws.
 Location, survey, and appraisal of lands to be
 purchased or acquired by exchange.

Prevention of forest fires: The work under this project includes all educational, admonitory and fire danger reduction work primarily directed toward preventing the occurrence of fires in the National Forests such as posting signs, registering visitors during the fire season, enforcement of closed area restrictions, issuance of campfire permits, lectures and exhibits on fire subjects, patrol for the purpose of cautioning campers and recreationists about the use of fire, investigation of the origin of fires, fire law enforcement and reduction of fire danger by disposal of any inflammable debris which is not chargeable to a specific activity such as timber sales.

The work under this project also includes the organization, training, instruction, management, and inspection of a force of fire guards depended upon for detection and suppression of fires except that work done after action starts to suppress fire is charged to "suppression of forest fires."

FOREST SERVICE (Continued)

Suppression of forest fires. This project includes the work done by all members of the permanent organization and regular fire guards in fighting forest fires. An exception is that the salaries and expenses of forest officers who are regularly assigned to special projects and paid from special appropriations are paid from the "fighting forest fires" appropriation when they are assigned to fire duty. Emergency guards are paid from the appropriation for fighting forest fires while actually engaged in fire suppression. Fighting any forest fire which may start in his vicinity has first call on the time of all forest officers regardless of the nature of the work they may be engaged upon at the time. Extremely valuable cooperation in fighting forest fires is almost universally given by employees of other Bureaus. Such cooperation is often secured when it would otherwise be impossible to secure crews of the necessary size with sufficient speed.

Construction of roads, trails, telephone lines, lookout structures, dwellings, etc. In the general statement regarding the work done under the Protection and Administration appropriation it was explained that District Foresters, Forest Supervisors and District Rangers necessarily give time to the supervision of the construction of improvements needed for the protection and administration of the National Forests; fire guards are so far as possible used in improvement work whenever a temporary lull in fire danger permits such a utilization of their time; and Rangers necessarily perform some labor on improvement work both because the isolation of the needed job makes that the cheapest way of getting necessary work performed, and because good business management requires that the time of Rangers be utilized on improvement work when weather conditions or slack periods in administrative work make improvement construction the most important work to be performed.

This project includes these supervisory and other activities as they are intermingled with the other administrative and protective work for which the permanent and regular temporary force is employed in the National Forest District offices and on the National Forests.

Maintenance of roads, trails, telephone lines, lookout structures, dwellings, etc. This project, like "construction of improvements", includes the time of the permanent and fire guard personnel of the Forest Service which is employed for the supervision and performance of the administrative and protective work on the National Forests but which at times is engaged in the maintenance of the telephone lines, structures, etc., required in the protection and administration of the National Forests.

Commercial timber sales. The timber on the National Forests is estimated to be 552 billion board feet, or approximately one-fourth of the standing timber in the United States. The timber cut from the National Forests for the fiscal year 1929 was 1,502,000,000 board feet (including sales at cost), an increase of 219 million board feet over the fiscal year 1928. The average number of timber sales made annually from the National Forests is well over 13,000 (including sales at cost). The cost of preparing, marking, scaling, and administering the timber involved in these 13,000 sales annually is met entirely out of this appropriation. The greater part of the volume of the annual cut comes from project sales; sales so large that they require the

FOREST SERVICE (Continued)

undivided time of one or more expert timbermen! The smaller sales are handled by the Rangers as a part of their many other duties. If economic conditions do not change present indications are that the cut for the fiscal year 1931 will be 285 million feet greater than in the fiscal year 1929.

Timber sales made to settlers and farmers for domestic use. These sales are made at the approximate cost of administration and are largely for such products as fence posts, coral poles, house logs, etc., although there is no prohibition on obtaining timber in the form of sawlogs and having it sawn into lumber at local sawmills. The purpose of Regulation S-22, which authorizes this disposition of timber to settlers and farmers at cost, is to aid in the development of the country through making available a supply of cheap wood products. No restriction is placed on the character of material which can be so obtained and it can be purchased at the cost rate without regard to its actual value as a commercial product. The number of these cost sales made annually (included in the 13,000 figure) average about 5,600 with a total board footage of around 116 million feet. Charges to this project represent the salaries and expenses of Forest Rangers almost entirely.

Development of forestry practice and support of such practice outside the National Forests. This project includes the time and expenses of forest officers while engaged on activities incident to the development of forestry practice and support of such practice outside the National Forests by private concerns and the public.

Exploration, location, cruising, and mapping of National Forest timber resources as a basis for management plans and as a necessary preliminary to timber sale programs and policies. There is an appropriation "Reconnaissance, National Forests" covering this activity, but in addition to the funds provided specifically there is a large expenditure of funds covering salaries of Forest Rangers and other Forest officers assigned to National Forests. The special appropriation is used for the larger projects, while the charges to the above project under this appropriation represent the salaries and expenses of Forest Rangers, Forest Supervisors, and others while engaged on timber survey work as a preliminary to the smaller sales and in gathering material for the preparation of forest management plans.

Reforestation by planting of National Forest areas. There is a direct appropriation "Planting, National Forests" which provides funds for the carrying on of this activity. In addition to this appropriation, however, there is an expenditure of funds from the Protection and Administration appropriation covering the time and expenses of regular administrative Forest officers who largely direct the nursery and field planting operations. The direct appropriation provides funds for the purchase of material and equipment and the hire of temporary labor to perform the manual labor of sowing, transplanting, and field planting. The overhead needed in this activity, however, must very largely come from the Forest officers primarily employed for general administration. When a planting project is inaugurated on any Forest, the Supervisor, one of his staff men, and one or more of his District Rangers handle the direction and supervision of the work and none of their time or expense is paid from the planting appropriation.

FOREST SERVICE (Continued)

Enforcement of provisions of contracts covering removal of timber for which no payment is made. Under free and administrative use much material is removed from the National Forests. Material, the removal of which benefits the silvicultural condition of the Forest or eliminates bad fire risks, is given free to settlers and farmers for their own domestic use. This material is removed from a definitely designated free-use area without permit or is authorized by a written permit to individuals.

Due to lack of markets it is sometimes impossible to dispose of timber in need of cutting, such as bug-infested and fire-damaged material, at the regular prices established for the forest concerned. Under these conditions it is permissible to dispose of the timber for a very nominal stumpage price, in extreme cases even without any stumpage, and timber so obtained may be disposed of by the permittee on a commercial basis. Such disposition is authorized under what is termed an administrative use permit.

Both of the above forms of timber disposal are handled by the Forest Rangers as a part of their regular administrative work. During the calendar year 1928 there was 12,514 free-use permits issued with a cut of 40,203,000 board feet and 25,500 users from designated free-use areas with a cut of 42,000,000 board feet.

Control of tree-destroying insects and diseases and of destructive rodents. So far as possible trees containing broods of destructive insects are disposed of to people who will take them out of the Forest and by peeling or burning them by Forest officers. With large infestations, however, it is necessary to hire temporary laborers, whose work is supervised by Forest officers. In either case the method followed in killing the beetles is that recommended by the Bureau of Entomology for the specific insect and kind of tree involved, as the result of years of scientific investigation and experimentation. During the past year destructive epidemics have been fought in Montana, Idaho, Oregon, Wyoming, Colorado and Arizona. The particular areas on which this protective work is most necessary are determined each year on the basis of reports from all National Forests, since epidemics frequently develop suddenly. In addition to combatting bark beetle infestations, some work on an experimental scale is being conducted in cooperation with the Bureau of Entomology in combatting infestations of defoliators, especially the spruce bud worm on the Shoshone National Forest, Wyoming, along the road from Cody to the eastern entrance to the Yellowstone Park.

Protection of timber from the white pine blister rust involves the destruction of currant and gooseberry bushes, which are alternate hosts of this disease. The methods to be used are those devised by the Bureau of Plant Industry as the result of its investigative and experimental work. The work consists of pulling up these bushes, or, for some species, of spraying them with chemicals which have been found to be effective. The work is done by crews of temporary employees working under the direction of Forest officers.

As part of their regular work Forest officers aid in the control and extermination of rodents, under the plans developed by the Biological Survey.

FOREST SERVICE (Continued)

Investigation in silviculture and forest products. Although there are specific appropriations for carrying on this work, there is some time contributed to the activity by the regular forest personnel. This is as it should be as the closer the contact between research and administration the more understandable and the better will be the application of the results furnished by research. Research by the individual members of the administrative force is encouraged and such participation has done much in solving ways and means of meeting difficult silvicultural problems which constantly confront the Rangers and sale men in the administration of the National Forest timber sales.

Regulation of use of grazing lands. The regulation of grazing lands on the National Forests involves the distribution of grazing privileges to secure the best correlated use of the range lands with improved ranch properties, the issuance of permits, collection of fees, establishment of allotments on which individuals or groups of permittees may graze their stock, the location and defining of allotment boundaries, the general supervision of the area, the establishment of seasons of use which will maintain the productivity of the forage crop and installation of methods of handling stock on the range so as to secure uniform utilization of the range. It further involves the determination of the correct carrying capacity of the range and the preparation and application of plans for handling the stock. Range development and improvement in the form of opening up unused range, the eradication of poisonous plants, and other forms of making range more usable are distinct parts of regulation.

In the development of range management plans the best practices followed by the more progressive stockmen are used as a guide. These, however, are supplemented by more intensive and scientific investigations on the time of the year when range plants can be used without injury, palatability of such plants under different climatic conditions and for different times of the year as well as for different classes of stock, the character and composition of the range plants, methods of handling stock which will secure better use of the range and safeguard protective values of National Forest land, study of soil and soil conditions and investigating the effect of grazing on lands which are producing or capable of producing timber, the relation of grazing to recreation and to other forms of land use on the National Forests.

Determination of grazing capacity of the range and the preparation and application of plans for grazing management, range development, and improvements. There is a specific appropriation "Reconnaissance, National Forests" covering this activity, but in addition to the funds provided specifically, Forest officers assigned to National Forests carry on the smaller range reconnaissance projects as a part of their administrative duties. The special appropriation is used for the large projects almost exclusively.

Scientific range investigations. Although there is a specific appropriation for carrying on this activity, Forest Rangers and others contribute their services to a small extent incidental to their administrative duties.

Development of fish and game resources and game law enforcement activities. The National Forests contain 75 per cent of the big game animals in the States in which they are located, and about an equal percentage of the total game range within these States. They also contain approximately 90 per cent of the principal fishing streams in the eleven western States. Through active cooperation with State Game Commissions and State and local game associations the Forest Service is cooperating in the enforcement of the game laws, in the restocking of areas and streams, in the construction and maintenance of rearing ponds, and in the formulation of game management plans which are applicable to the areas in question and which have as their object the complete development of the resource with its continued use. Studies which are being made by local forest officers on life habits and numbers of game animals, the character and condition of streams and the food supply available for fish are used extensively by State game authorities in the formulation of adequate game laws. This work is carried on by Forest officers in charge of physical units as a part of their regular administrative duties.

Management of agricultural settlement under Federal homestead act and claims under various public land laws.

- 1- Re-examinations of areas of possible agricultural value to ascertain whether previously undetermined, or changing conditions warrant reclassification and listing for entry. Preparations of reports of findings and corrections of classification records.
- 2- Periodic checks of listed areas to determine progress of settlement, improvement and cultivation, as bases of final reports and recommendations upon applications for patent.
- 3- Periodic checks upon mining claims, and easements under public land laws, to determine nature of use, improvement and development, as basis of final reports to Department of the Interior.

Location, survey and appraisal of lands to be purchased or acquired by exchange.

- 1- Receipt or reference of offers to sell or exchange lands within National Forests.
- 2- Determination of location and boundaries of offered lands; examination, cruise and appraisal thereof; preparation of reports thereon; administrative consideration of reports; preparation of final recommendations to National Forest Reservation Commission, where lands acquired under the Weeks Law are involved, or to the Secretary of the Interior where lands are reserved from public domain.

Regulation of private occupancy of National Forest lands for all purposes other than timber or grazing.

- 1- Receipt of applications for special-use permits.
- 2- Examinations of areas applied for to determine suitability for exclusive private occupancy, surveys thereof and reports thereon.

FOREST SERVICE (Continued)

- 3-Periodic examinations of permitted areas to determine that private occupancy is in conformity with permit requirements and not resulting detrimentally to National Forest interests.
- 4-Periodic collection of special use fees or payments. Action on delinquent cases.
- 5-Annual preparation of reports of special-use occupancy. Closure of cases.
- 6-Special-use permits outstanding July 1, 1929 -- 39,515. Fees paid fiscal year 1929 ---- \$287,119.09.

Surveying and mapping National Forest lands for general purposes. Inasmuch as a large percentage of the total area of the National Forests is unsurveyed it is necessary to make such general surveys and maps as are necessary to improve the effectiveness of fire control, locate timber sale and special-use areas, etc.

Appraisal of recreational resources of National Forest lands and preparation of work plans.

- 1-Determination of national forest areas chiefly valuable and needed for use (a) as public campgrounds, (b) as sites for hotel, resort, sanatoria, camp, or summer-home development; and mapping and classification thereof.
- 2-Preparation of plans of development to govern (a) upon public campgrounds the location of essential facilities such as water supplies, fireplaces, garbage pits, toilets, etc.; and (b) upon recreation areas, road and trail construction, division into suitable lots or individual areas, location and arrangement of utilities such as water systems, and determination of limitations or principles to govern construction and maintenance of structures and other improvements by permittees.

CHANGES IN LANGUAGE

Introductory paragraph:

The proviso in the introductory paragraph relating to the cost of buildings has been revised to read as follows:

"Provided, That the cost of any building purchased, or as improved, exclusive of the cost of constructing a water supply or sanitary system and of connecting the same with any such building, and exclusive of the cost of any tower upon which a lookout house may be used, shall not exceed \$2,500."

FOREST SERVICE (Continued)

At the present time the Act of March 3, 1925, authorizes the construction of six buildings per year costing in excess of \$1,500. The act of May 22, 1928, authorizes the construction of buildings costing not to exceed \$2,500 when the buildings so constructed are paid for from the Forest Research appropriations.

The proposed change in language raises the cost limitation on all buildings to \$2,500. This does not mean that all buildings constructed will cost in the neighborhood of \$2,500. The present \$1,500 limitation is, however, inadequate for the construction of Ranger station dwellings, and in a few instances, warehouses. Neither dwellings or warehouses are constructed where it is possible to rent usable structures but in undeveloped regions buildings are seldom available for renting and construction of simple buildings must be resorted to. Under prevailing costs for material and labor it is asking the impossible to expect a dwelling to be constructed for \$1,500 in which a qualified Forest officer is willing to place his family.

National Forest District No. 2.

In the item referring to National Forest District 2 the limitation on the amount which may be expended for maintaining the herd of long-horned cattle on the Wichita National Forest has been raised from \$500 to \$1,000. The number of animals in this herd has increased from 30 in 1927 to 60 in 1929. The combined limitation and authorization of \$500 will be inadequate in the fiscal year 1931. It is proposed to build this herd up to 200 animals and when this figure is reached the surplus animals will be offered for sale. It is expected that the revenue from these surplus animals will equal the cost of maintaining the entire herd.

FOREST SERVICE (Continued)

(c) FIGHTING FOREST FIRES

Appropriation, 1930..... \$100,000

Budget, 1931..... 100,000

Project Statement

<u>Project</u>	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>
Suppression of Forest fires	\$1,149,352	\$67,000	\$67,000
Protection of lands, railroad forfeiture suits	<u>68,791</u>	<u>33,000</u>	<u>33,000</u>
Total	\$1,218,143	\$100,000	\$100,000

Activities under this AppropriationGeneral

This appropriation is used exclusively for the suppression of forest fires, with the exception of the amount required to give the lands known as the Coos Bay Wagon Road and Oregon and California railroad lands the same protection from fire which is given adjacent National Forests or privately owned lands protected by associations of private owners. Expenditures are made for the employment of fire fighters and their transportation, equipment needed on going fires when not available in stocks of equipment previously purchased from the Protection and Administration appropriation or in connection with fires of previous years. The appropriation is used for travel expenses of forest guards when going to or returning from fires and for the travel expenses of regular employees of the Service when the travel performed extends beyond the boundary of the unit to which they are regularly assigned or when the activities to which men are assigned do not include fire fighting.

The amount given in the appropriation act is nominal because it is impossible to predict in advance what the expenditures for such an uncertain activity may be. Supplemental estimates are submitted each year, for the Deficiency Act, to cover expenditures in excess of the amount appropriated in the regular appropriation act.

FOREST SERVICE (Continued)(d) AERIAL FIRE CONTROL

Appropriation, 1930.... \$50,000
 Budget, 1931 50,000

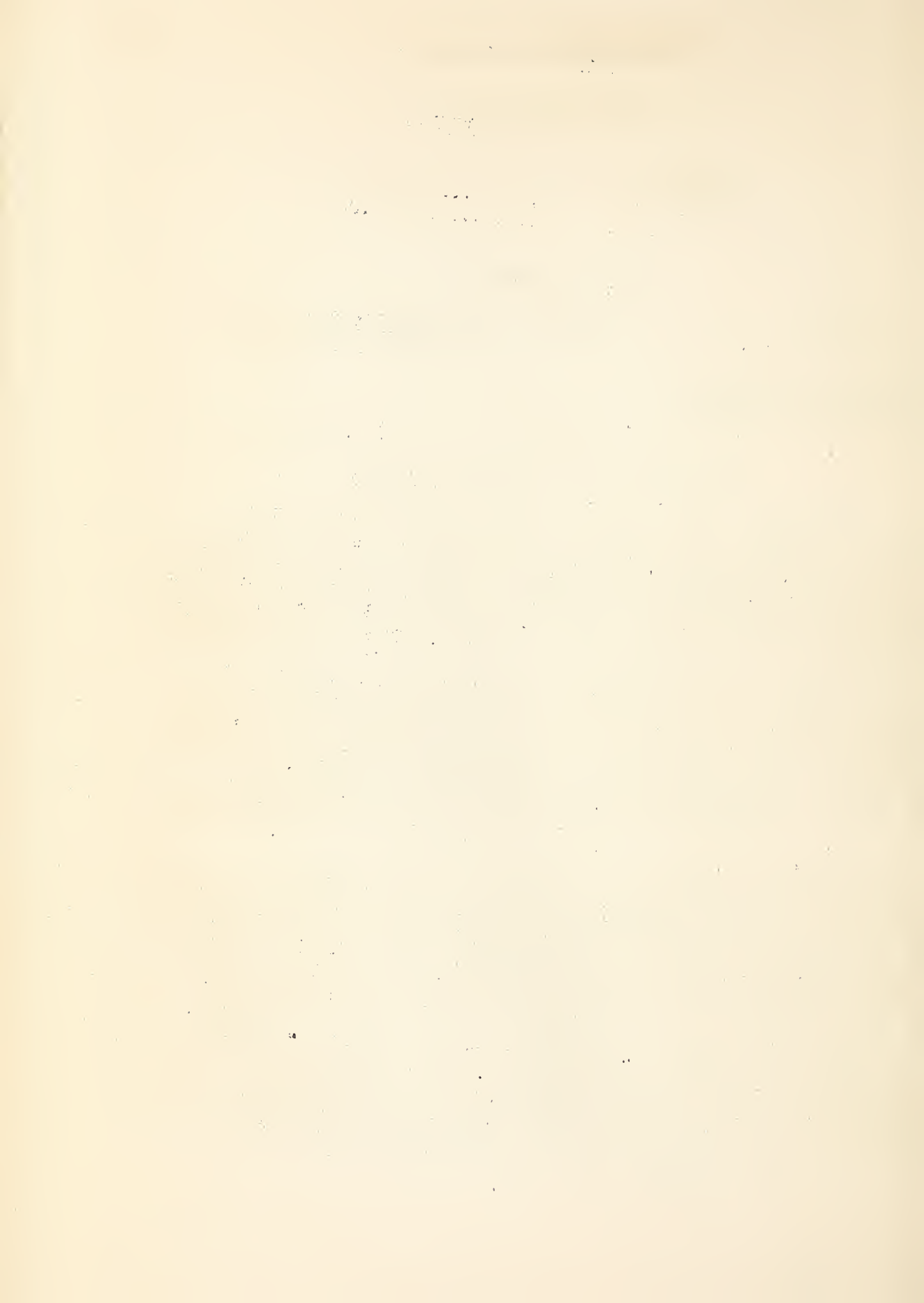
Project Statement

<u>Project</u>	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>
Aerial detection and reconnaissance of forest fires	\$43,946	\$50,000	\$50,000

Activities under this Appropriation

This appropriation is used to operate aircraft in California, Oregon, Washington, Idaho, Montana and Arkansas in forest fire protection work. Beginning with the fiscal year 1929 this activity was carried on by contracting with commercial flyers instead of in cooperation with the War Department. The Forest Service has used aircraft in protection work for eleven seasons. It was at first believed air patrol would afford quicker detection of fires than could be secured by lookout men on towers and mountain peaks. Experience has disproved this as a general proposition. Nor is it surprising that relatively few first reports of fires have come from the aircraft, since any one locality is under observation only a short time during the twenty-four hours even if two or three patrols are made daily. Continuous observation of the terrain, such as lookout men on towers and mountain peaks have if intervening topography does not cut off a great part of their view, is essential to effective fire control.

The use of airplanes after lightning storms to search out smoldering fires which might be hidden from ground lookouts by intervening ridges has as yet given disappointing results but the possibilities of this use of aircraft have not been exhausted. During the past season a fire on the Superior National Forest escaped and assumed large proportions. A seaplane was necessarily used to reconnoiter this fire and in the course of such reconnaissance flight several new lightning fires were discovered which were hidden from the lookout men on towers by the smoke of the large fire. In this unusual situation on the Superior National Forest the seaplanes used were of incalculable aid in reconnoitering the large fire, in rapid transportation of men and equipment from lake to lake and in the discovery of new fires which otherwise might have assumed considerable size before detection on account of the smoke blanket.



FOREST SERVICE (Continued)(e) LANDS

Appropriation, 1930 \$52,500
 Budget, 1931, 1932..... 52,500

Project Statement

<u>Project</u>	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>
Classification of national forest lands, survey and appraisal of lands to be acquired by exchange, and entry survey of forest homesteads.	\$50,385	\$52,500	\$52,500

Activities under this Appropriation

Land classification work now consists of re-examinations of classified areas where new conditions warrant corrections of original classification, or where appeals for corrections of classifications are made. Nature and extent of work varies from year to year and cannot definitely be forecasted.

Entry survey work necessary where listings and entries of land under forest homestead laws cannot be made by legal subdivisions. A varying number of cases still require attention annually and due to their isolation the cost per case is now higher than in earlier years.

Land exchange work is now the major activity under this item.

Since 1908, Congress has enacted fifty land exchange laws of more or less general application, and fourteen laws authorizing exchanges with specified land owners. Other bills are now pending in Congress. Two of these laws give the Secretary of Agriculture general authority to approve exchanges; one with relation to lands acquired by purchase under the Weeks law and Clarke-McNary law; several laws authorize exchanges for land within specified distances of the exterior boundaries of National Forests.

National Forests now contain almost 25,000,000 acres of private or State lands. Lands outside of National Forests but subject to acquisition through exchange, under existing laws, aggregate several million acres more.

FOREST SERVICE (Continued)

Forest Service has established rule that the maximum value of stumpage granted in exchange for lands, in any single State, shall not exceed 10 per cent of National Forest receipts in same State during same year. In most States the volume of offered business equals or exceeds this limit. As the National Forest receipts increase there will be a comparable increase in the volume of exchange work.

During the period from 1908 to 1929, the record of land-exchange business transacted has been as follows:

<u>Cases con-</u> <u>summated.</u>	<u>Offered Lands</u>		<u>Selected Lands</u>		<u>Selected</u> <u>Timber</u>
	<u>Area</u>	-- <u>Value</u>	<u>Area</u>	-- <u>Value</u>	
391	485,793	\$2,259,945	132,014	\$971,897	\$1,020,678

For the year ending December 31, 1928, the volume of business was:

<u>Cases con-</u> <u>summated.</u>	<u>Offered Lands</u>		<u>Selected Lands</u>		<u>Selected</u> <u>Timber</u>
	<u>Area</u>	-- <u>Value</u>	<u>Area</u>	-- <u>Value</u>	
139	115,067	\$406,534	25,269	\$89,947	\$272,371

Approved by
Secretary of
Agriculture.

145	262,737	1,018,436	22,054	\$170,065	\$724,000
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(f) SANITATION AND FIRE PREVENTION

Appropriation, 1930	\$50,000
Budget, 1931	<u>57,000</u>
Increase	7,000

The proposed increase is to cover increased costs of maintenance. As the number of improved campgrounds, and the number of facilities erected thereon, has grown from year to year, an increasing part of the annual appropriation has been needed for maintenance, thus diminishing the rate at which the required improvements can be provided.

Project Statement

<u>Project</u>	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>	<u>Increase</u>
Construction and maintenance of sanitary facilities and for fire prevention on public campgrounds	\$39,219	\$50,000	\$57,000	\$7,000

FOREST SERVICE (Continued)Activities under this Appropriation

The work done under this appropriation consists of clearing or otherwise preparing areas required as public campgrounds, and installing thereon simple water, sanitary, and fire control facilities with the view (a) of concentrating campers upon areas of low fire and sanitary hazard, (b) preventing the occurrence of unsanitary conditions, and (c) minimizing risk of fire damage to National Forest timber. All appropriations made under this item are expended exclusively for materials and labor, no part being used for overhead cost. Appropriation is prorated between the nine National Forest districts in the same proportion as the estimated cost of the District program bears to the total cost.

During calendar year 1928, the number of people who used the National Forests for recreational purposes was estimated to be 23,008,997; divided into classes as follows: Special-use permittees and guests, 385,518; Hotel and resort guests, 1,331,595; Campers, 1,845,693; Picnickers, 2,937,511; and Transient motorists, 16,458,680. This represents an increase of 23 per cent over the preceding year, and of 628 per cent over the year 1917, when the first detailed estimates of recreational use were compiled.

This enormous use of National Forests is not only of outstanding social importance and advantage, but it is also the basis of an extensive commercial development, creating markets for services and supplies which are of nation-wide significance.

It does, however, create hazards to public property and health. Such hazards can effectively be minimized or eliminated by provision of adequate public campgrounds affording simple facilities for the control of fire and for good sanitation. The chief purpose of the campgrounds is a protective one; the concentration of risks within areas where they can be controlled or guarded against. The protective value of campgrounds has repeatedly been demonstrated by the experience not only of the Forest Service but of other forest protective agencies.

Every effort has been made to secure the cooperation of municipalities, counties and other agencies in this campground improvement, and thus far 17 per cent of the cost has been borne by such cooperators.

FOREST SERVICE (Continued)(g) EQUIPMENT AND SUPPLIES

Appropriation, 1930.... \$130,000
 Budget, 1931 130,000

Project Statement

<u>Project</u>	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>
Purchase and maintenance of equipment and supplies	\$129,600	\$130,000	\$130,000

Activities under this Appropriation

This appropriation is used largely for the purchase of stationery and office supplies in general use in Forest Service offices. The purchase of stationery and office supplies for all offices outside of Washington, D. C. is centralized at the Forest Service depot at Ogden, Utah. As much as possible of the appropriation is used for the purchase of urgently needed fire fighting equipment.

This appropriation has never been intended to provide all the supplies and equipment used in all the activities of the Forest Service. The Protection and Administration appropriation is used in part and special appropriations are used for special supplies and equipment needed for the particular activities financed from such special appropriation.

(h) PLANTING, NATIONAL FORESTS

Appropriation, 1930 \$210,000
 Budget, 1931 225,000
 Increase 15,000

\$15,000 for reforestation by planting of national forest areas and investigations of planting and nursery problems. There are 2,205,000 acres of National Forest land which should be growing good timber crops but are not doing so. Past fires are the chief cause of this condition. The Eastern National Forests, however, contain some open areas of abandoned fields and pastures which should be planted and which are included in the above figure. The present appropriation of \$210,000 is sufficient for a planting program of between 20,000 and 25,000 acres annually,

FOREST SERVICE (Continued)

so that it would require 100 years to finish the job now on hand. In addition, the program of the National Forest Reservation Commission for land purchase east of the Great Plains is constantly adding areas of accessible, open or burned land which must be planted in order to be productive of wood crops. The requested increase of \$15,000 is chiefly to start planting or to enlarge the scale of existing projects to be more nearly commensurate with the needs on eastern Forests. This increase will be used to start an adequate planting program on the Allegheny Forest in Pennsylvania, where there are at least 60,000 acres needing planting; for planting burned and open lands on National Forests in Wisconsin, Minnesota, and the northern peninsula of Michigan; and to increase the rate of planting on the Monongahela and other Forests in the Appalachian region. These are all urgent projects which can not be financed under the existing appropriation without abandoning projects now under way on Forests west of the Great Plains, including large investments in existing nurseries. The enlargement of the planting appropriation is necessary to carry out the purposes for which Forests have been created in the eastern United States.

If this increase is not received, planting on the National Forests will continue at a rate which is entirely too slow for the job in hand. Large areas which have a high productive capacity will remain idle for many years, an expense to the Government and of no benefit for a future timber supply for the Nation.

Project Statement

<u>Project</u>	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>	<u>Increase</u>
Reforestation by planting of national forest areas and investigations of planting and nursery problems.	\$211,037	\$210,000	\$225,000	\$15,000

Activities under this Appropriation

Planting on the National Forests is resorted to only where it is not possible to obtain regeneration naturally. In sales of National Forest timber provision is made for natural regeneration through the reservation of seed trees. Where fires have repeatedly burned over areas there is nothing left to furnish seed and as a result such areas grow up to a tangle of weeds, brush and light seeded tree species of low commercial value. Unless such areas are planted they will remain in this non-productive condition for a long period of years.

FOREST SERVICE (Continued)

There is much to be accomplished before the young plants can be furnished for the restocking of such devastated areas. Nursery sites must be provided, improvements including dwellings, storage sheds, extraction plants, watersystems and cultivation machinery must be purchased and constructed, cones must be collected and the seeds extracted and cleaned, and last the seed must be planted and the plants tended up to the time they are ready to be transplanted to the field. Care must be given the planting of each individual tree if it is to withstand the first three or four years battle to survive. Once established the trees grow rapidly and it is a reasonably good risk that they will reach maturity. From 800 to 1200 trees are planted per acre so the job of furnishing planting stock for an annual program of 25,000 acres is no small undertaking and requires constant careful planning years in advance of each year's output. Through experience the technique of both nursery practice and field planting has improved and is resulting in lower total costs for reforestation.

(i) RECONNAISSANCE, NATIONAL FORESTS

Appropriation, 1930	\$108,550
Budget, 1931	<u>121,000</u>
Increase.....	\$12,450

The increase of \$12,450 is submitted for the following purposes:

(1) \$7,500 for exploration, location, cruising, and mapping of national forest timber resources as a basis for management plans and a necessary preliminary to timber sale program and policies. The timber survey allotment from the Reconnaissance appropriation has stood at \$67,100 since the fiscal year 1925, while the timber business has been increasing by at least a third. (1,093,278,000 board feet in calendar year 1924. 1,336,601,000 board feet in calendar year 1928, and an estimated cut of 1,500,000,000 board feet in calendar year 1929. The cruising of timber as part of the preparatory work for sales and for plans of management of the timber resource has not kept pace with the increase in business. An increase in the appropriation is necessary if the timber business and receipts from timber sales are to be increased or even maintained. Timber survey work has to be done in many cases two to five years before sales are made, and the present appropriation is insufficient to keep the work ahead of the growing sales business. If this increase is not granted it will not be possible to place timber on the market within a reasonable time after applications for timber are received.

FOREST SERVICE (Continued)

(2) \$4,950 for determination of grazing capacity of the range and the preparation and application of plans for grazing management, range development and improvements. An allotment of \$41,450 from the Reconnaissance appropriation has been available for range reconnaissance for the past several years. Since 1912 about 39,000,000 acres have been surveyed by reconnaissance methods. Approximately 44,000,000 acres of National Forest land used for grazing have not been covered by reconnaissance and lack the basis for accurate and complete resources and for comprehensive management plans. The need for more exact knowledge regarding the grazing resources and for comprehensive management plans increases as the pressure for grazing privileges on the National Forests grows stronger; as the number of game animals steadily increases; as recreational use expands; and as watershed and timber production becomes more urgent. In order that range adjustments may be made wisely and justly as their need arises under these expanding uses it is urgent that 20,000,000 additional acres be covered by reconnaissance within a reasonable time. If the increase is not allowed it will not be possible to collect the basic data upon which the necessary adjustments in the regulation of the use of National Forest ranges are made.

Project Statement

<u>Project</u>	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>	<u>Increase</u>
<u>Reconnaissance</u>				
Exploration, location, cruising, and mapping of national forest timber resources as a basis for management plans and as a necessary preliminary to timber sale program and policies.	\$69,492	\$67,100	\$74,600	\$7,500 (1)
Determination of grazing capacity of the range and the preparation and application of plans for grazing, management, range development and improvements.	<u>42,587</u>	<u>41,450</u>	<u>46,400</u>	<u>4,950 (2)</u>
Total	\$112,079	\$108,550	\$121,000	\$12,450

FOREST SERVICE (Continued)

Activities under this Appropriation

Timber surveys: The first step in the management of the timber resources of the National Forests is the determination of the kinds and amount of timber available in the different units. When this information is obtained it is possible to group together those units which are logically tributary to the same general lines of transportation which will carry the raw material to a common manufacturing center. Once the boundaries of such a unit of operation are decided upon and an inventory had of the merchantable timber and young growth therein, it is possible to determine the amount of timber which can be removed annually without depleting the growing stock or wood capital. All of this information is brought together in what is termed a forest management plan, and such a plan definitely fixes the annual cut and the timber sale policies and systems of cutting to be followed. A great many of these plans have been prepared and a great many more are needed. It is not possible to intelligently plan for future business, nor can the Forest Service properly encourage the investment of capital for the manufacture of its timber unless it rather definitely knows what it has to offer in the way of a permanent supply of raw material.

Timber surveys made to procure this information can be comparatively extensive in character since the cut is planned over a long period of years and there will be opportunity for adjustment. Once capital has been interested and the manufacturing plant assured, it is then necessary to put up a block of timber for sale and since the stumpage prices found in the appraisal are largely influenced by the volume of timber to be cut it is essential that an accurate estimate of the timber be obtained. Thus in preparing for sales of timber two types of survey are needed: (1) an extensive survey to determine how much timber can be cut from the unit annually (a preliminary examination), and (2) intensive surveys at frequent intervals of portions of the unit to fix the value of the stumpage for individual sales.

Range Reconnaissance: Plans of management are also prepared to govern the handling of the forage resources of the National Forests. The range is divided up into grazing allotments - units of a size to accommodate the stock of a single individual or a group of individuals. Each allotment has a plan of management prepared for it fixing the number of stock which can be grazed without reducing the productivity of the area. It provides for the manner in which the stock shall be grazed, the order in which the different units within the allotment shall be grazed as the season progresses, the location of the salt grounds and the supervision necessary to obtain the best utilization of the range.

Most of the grazing allotments at present have a plan of management of some nature but many of them are based on very incomplete information. In order that the best use of this grazing resource may be obtained it is essential that basic information be obtained by a grazing survey of the 20,000,000 acres still to be covered. These surveys determine the number and kinds of forage plants found per acre on the range, their palatability, period of seeding and such related data and furnish a basis for determining the carrying capacity of the different units. Without this information it is simply a question of "trial and error" with the very serious probability of doing damage by overgrazing, which will require years to correct and further to seriously impair the watershed values of the grass cover.

FOREST SERVICE (Continued)(j) IMPROVEMENTS, NATIONAL FORESTS

Appropriation 1930	\$645,000
Budget 1931	<u>2,500,000</u>
Increase	<u>\$1,855,000</u>

The increase of \$1,855,000 is submitted for the following purposes:

(1) \$306,000 for the construction of protection improvements other than roads and trails. Although the creation of the National Forests was authorized by the Act of June 4, 1897 and most of these forests have been under Federal management for over twenty years, it is necessary to say that in many instances they still lack the most rudimentary improvements necessary for their protection. The additional investment necessary to complete an adequate system of protective improvements would be relatively small, when compared to the values at stake and the amounts expended for personnel and particularly the amounts expended for suppression of fires after they have grown large and extremely difficult to handle.

Out of the twenty-two fires which reached 3,000 acres or over in size in California during 1928, eleven swept in from outside the National Forests and could not possibly have been stopped at the National Forest boundaries without the aid of artificial barriers or fire breaks prepared in advance. Analysis of the 1928 records for the California National Forests shows that 26 per cent of the fires which attained 100 acres or more in area are chargeable to the fact that lookouts and fire guards were spread too thinly. More personnel is clearly necessary, but the addition of more lookout men and fire guards will be largely ineffective unless telephone lines and lookout houses can be provided so that the additional men can be stationed at the proper points and kept within communication.

The opportunities for artificial reforestation in the Lake States are unusually attractive but the plantations already made and those resulting from future plantations may easily be lost unless they are safeguarded by an adequate system of fire breaks. Machinery has been developed which constructs and maintains fire breaks in such a region at an extremely low cost but present appropriations are totally inadequate to meet even the small necessary expenditures for this purpose.

The protection of the National Forests calls for an investment in a protection plant which it has not been possible to make with current appropriations. The critical part played in fire losses by lack of protective improvement has been strongly emphasized by the experience of the season of 1929 and in numerous previous years. It is hoped that appropriations may be approved which are reasonably commensurate with the size of the undertaking. The needed improvements must be constructed some time. The sooner the job is completed the sooner will the wastage of the re-

FOREST SERVICE (Continued)

sources on these public properties be stopped.

It is anticipated that the \$306,000 increase will be used for the following classes of improvements:

Construction of telephone lines	\$200,000
Construction of fire breaks	31,000
Construction of lookout structures	49,000
Construction of barns	6,000
Construction of other buildings	<u>20,000</u>
	\$306,000

(2) \$25,000 for protection improvements in Southern California.

This increase will be applied on the special program of fire control improvements on the four National Forests in Southern California, the expenditure of this additional amount being subject to a like increase in funds advanced by the local cooperating agencies.

The original program arising from the disastrous fires of 1924 and the subsequent recommendation of the Board of Review, contemplated construction of improvements costing \$3,000,000 of which the Federal Government would pay one-half. Total Federal appropriations to June 30, 1930, amount to \$450,000. Maintenance cost will increase from year to year and will materially delay completion of the program. During the five year period ending with the season of 1928, 34 per cent (438,000 out of 1,303,000 acres) of burned acreage on the National Forests in California occurred on the four southern California forests. Experience has demonstrated conclusively that the construction of additional fire breaks, telephone lines and other protective improvements is indispensable if adequate protection is to be given to the National Forest areas upon which large municipalities and enormously valuable agricultural developments depend for their water supply. The values at stake, the difficulty of protecting these watersheds and the disastrous fires of 1924, 1928 and other years make halfway measures dangerous. Rapid progress in the construction of vital protection improvements is urgently needed.

The increase of \$25,000 will be used for the following purposes:

Construction of telephone lines	\$2,000
Construction of fire breaks	21,000
Construction of lookout structures	<u>2,000</u>
	\$25,000

(3) \$15,000 for the construction of range improvements. Range improvements consist of: drift, division, and boundary fences; water development projects, driveways; eradication of poisonous plants, cabins, bridges, corrals, and pastures. It is through the construction of these forms of range improvements that National Forest land is more adequately protected and made more usable. As a necessary safe-

FOREST SERVICE (Continued)

guard to the continued productivity of the forage crop they make possible the control of the stock to a given area at the right time of the year. They involve the improvement of range lands through the development of water and the eradication of poisonous plants on range lands not now usable. Their construction further means a reduction of administrative expense in the patrol of forest boundaries and in the prevention of trespass.

A special reason for increased appropriations for range improvements lies in the fact that increased grazing fees are being put into effect which more nearly represent the commercial value of the grazing privileges than did the former feed. While the permittees have been willing to expend money for range improvements because they realized they were paying low grazing fees, they are unwilling to continue, with their own funds, to construct these improvements when the grazing fee more nearly approximates the real commercial value of the use of the forest range. In view of this situation the Secretary of Agriculture in 1927 pledged his support to an adequate appropriation that would enable the Government to construct the necessary improvements on the forest ranges. Failure to receive this increase will prevent reasonably good management and utilization of National Forest ranges, and will also prevent the Federal Government from carrying through in good faith its part of a general program of increasing receipts from these ranges.

The increase of \$15,000 will be used for the following:

Construction of fences	\$12,500
Construction of water development projects	<u>2,500</u>
	\$15,000

(4) \$9,000 for the construction of administrative improvements.

The administration of 159,000,000 acres of National Forest lands, largely in undeveloped regions, unavoidably requires a certain minimum of structures such as dwellings for District Rangers and others who must be stationed away from towns and cities, cabins for the shelter of men and equipment at frequently used points on the routes of travel followed in the course of administrative work, barns for the care of animals, shelter for machinery and motor vehicles, simple office buildings, in which records can be kept and necessary office work performed and business transacted with the users of the forests, pasture fences and water development at stations from which administrative activities are carried on. The urge to make the utmost progress with the development of improvements needed specifically for protection has inevitably involved postponement of needed administrative improvement and neglect of the maintenance of such structures as have been built.

Because of the extreme diversity of the resources involved, the kinds of business and work carried on and the impossibility of such close supervision as is appropriate where work is concentrated in a factory or an office building, it is necessary that even in District Ranger positions men be employed who have an unusual degree of resourcefulness,

FOREST SERVICE (Continued)

intelligence, initiative, and responsibility. Men of this type can not be held when they and their families are expected to live in inadequate, dilapidated or poorly maintained quarters. In too many instances this is the case at present and the increase will be applied in curing this situation.

The increase of \$9,000 will be used for the following:

Construction of dwellings	\$4,000
Construction of other structures	<u>5,000</u>
	\$9,000

(5) \$1,500,000 for the construction and maintenance of protection roads and trails. All experience in fire protection emphasizes the necessity of catching fires small if losses are to be prevented and the costs of fire fighting are to be kept within reason. Success in catching fires while small depends on speed in reaching them and this in turn depends largely on roads and trails. When roads and trails are available, fires are reached promptly and are normally either controlled at once or rounded up within the first twenty-four hours.

An analysis of California National Forest fires of over 100 acres in 1928 which were not rounded up within the first twenty-four hours shows that 29 per cent of such failures are attributable to lack of roads and trails.

An analysis of large fires on the National Forests of North Idaho and Western Montana in the disastrous season of 1926 shows that 21 per cent of such fires became large primarily because of lack or scarcity of trails. These fires which were chargeable to lack of trails cost about \$156,000 to suppress and caused damage estimated at \$700,000.

Under existing legislation approximately \$3,000,000 is appropriated annually from the Forest Road and Trail appropriation for the construction and maintenance of roads and trails needed for the protection and development of the National Forests. This program, however, must provide for roads needed for administration and utilization of timber, and other resources, as well as for strictly protection needs. At the rate of construction in effect in the fiscal year 1930 it will be 37 years before the roads and trails at this time included in the development plans can be completed.

The increase of \$1,500,000 in the Improvement appropriation will be expended exclusively for roads and trails needed for protection purposes, and will make it possible to speed up the construction program to a marked degree.

FOREST SERVICE (Continued)Project Statement

	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>	<u>Increase</u>
Construction of telephone lines	\$ 106,755	\$ 108,000	\$ 310,000	\$202,000
Construction of fire breaks	57,241	69,000	121,000	52,000
Construction of lookout structures	51,645	51,000	102,000	51,000
Construction of dwellings	51,113	50,000	54,000	4,000
Construction of barns	11,716	12,000	18,000	6,000
Construction of other buildings	55,123	55,000	80,000	25,000
Construction of corrals	431	..	..	..
Construction of fences	43,141	98,000	110,500	12,500
Construction of water development projects	22,062	12,000	14,500	2,500
Construction of fire roads and trails	...	..	1,500,000	1,500,000
Maintenance of telephone lines	105,630	114,420	114,420	..
Maintenance of fire breaks	6,021	6,500	6,500	..
Maintenance of lookout structures	3,843	4,300	4,300	..
Maintenance of fences	16,714	17,800	17,800	..
Maintenance of dwellings	26,337	28,500	28,500	..
Maintenance of barns	4,310	4,400	4,400	..
Maintenance of other buildings	6,922	7,500	7,500	..
Maintenance of corrals	49	80	80	..
Maintenance of water development projects	6,113	6,500	6,500	..
Maintenance and construction of Cass Lake dam	11,000	..	..	..
Total	\$ 586,166	645,000	2,500,000	1,855,000

Activities under this appropriation

At the present time this appropriation is used for the construction and maintenance of all improvements needed for the administration and protection of the National Forests, except roads and trails, and camp ground improvements. There are special appropriations for the two latter classes of improvements. The principal classes of improvements constructed and maintained at present are telephone lines, lookout structures, fire breaks, barns, fences, dwellings and other buildings.

In the fiscal year 1931, however, \$1,500,00 has been set aside in the Budget figure for the construction and maintenance of roads and trails needed for protection purposes. This will supplement the amount provided in the regular road and trail item.

Limited amounts are used for the special protective improvements on the Angeles, Cleveland, Santa Barbara and San Bernardino National Forests in southern California and for the construction and maintenance of boundary and range division fences and other improvements necessary for the control of stock on the grazing ranges on the National Forests. The appropriation is largely used for materials and their transportation to point of use, every effort being made to supplement this special appropriation by utilizing the time of fire guards and rangers during the intervals when their services can be spared from protective and other duties for which they are primarily employed.

Changes in language

The limitations on the amounts which may be expended for the construction and maintenance of protection improvements in Southern California and for range improvements have been increased to \$150,000 and \$100,000 respectively.

A special proviso has been added at the end of the item to cover the expenditure of \$1,500,000 on roads and trails.

FOREST SERVICE (Continued)FOREST RESEARCHGeneral

Increases for five lines of forest research are recommended for the Forest Service under the authorizations of the McSweeney-McNary forest research Act:

Section 2, forest management,	\$60,000
7, range investigations	18,000
8, forest products	50,000
9, forest survey	85,000
10, forest economics	25,000
Total	<u>\$238,000</u>

In the broadest sense the objectives of the comprehensive program of forest research in the Forest Service and other bureaus of the Department of Agriculture outlined by the forest research act are to supply a scientific foundation for:

1. The productive use of forest land in the United States, which aggregates about one-fourth of our entire land area, an area nearly as large as that now classified as improved agricultural land.

The productive use of forest lands includes the growing of wood and other forest products sufficient to meet American requirements, which are now nearly half of world requirements. Productive use includes also making lands most effective for watershed protection and for assuring satisfactory production and use of the forage, wild life, recreational and other forest resources.

Productive use is important because present-day American standards of living require a relatively high per capita consumption of wood, and these standards should not be lowered by shortages. Productive use is important also because idle land is an economic burden. Surrounding and more prosperous districts must, for example, contribute to the support of the sparse populations through increased taxation. Productive use is important because the permanence of forest industries depends absolutely upon continuous wood supplies. As a group these industries rank about fourth among American industries and have a capitalization of about \$3,600,000,000 exclusive of forest land and stumpage worth at least \$10,000,000,000 more.

Bringing and maintaining forest lands in productive use is a complex and difficult problem. Within the forest regions of the United States there are wide variations in topographic, climatic, soil, and other conditions. Out of a total of about 850 forest tree species we have something like 65 of high commercial value. The forest management of most European countries deals with only two or three species—fewer, in fact, than are found in any one of our important forest regions.

FOREST SERVICE (Continued)

Back of European forest practice are many decades or even centuries of tradition. In the United States we are starting from scratch. Conditions affecting production and use of forest ranges are equally variable and complex.

2. Reduction of waste in the manufacture and utilization of wood, which is now responsible for about two-thirds of the annual cut from our forests, and also for the effective utilization of the many species of wood which are consumed by the American public.

The primary benefits accrue to forest land owners by making timber growing more profitable, and to the ultimate consumer of wood through better service.

The difficulty and complexity of forest products work is increased through the large number of American tree species and because of the great variation in the properties of single species. This variation in one sense is a liability, but it may be made an asset through full scientific information.

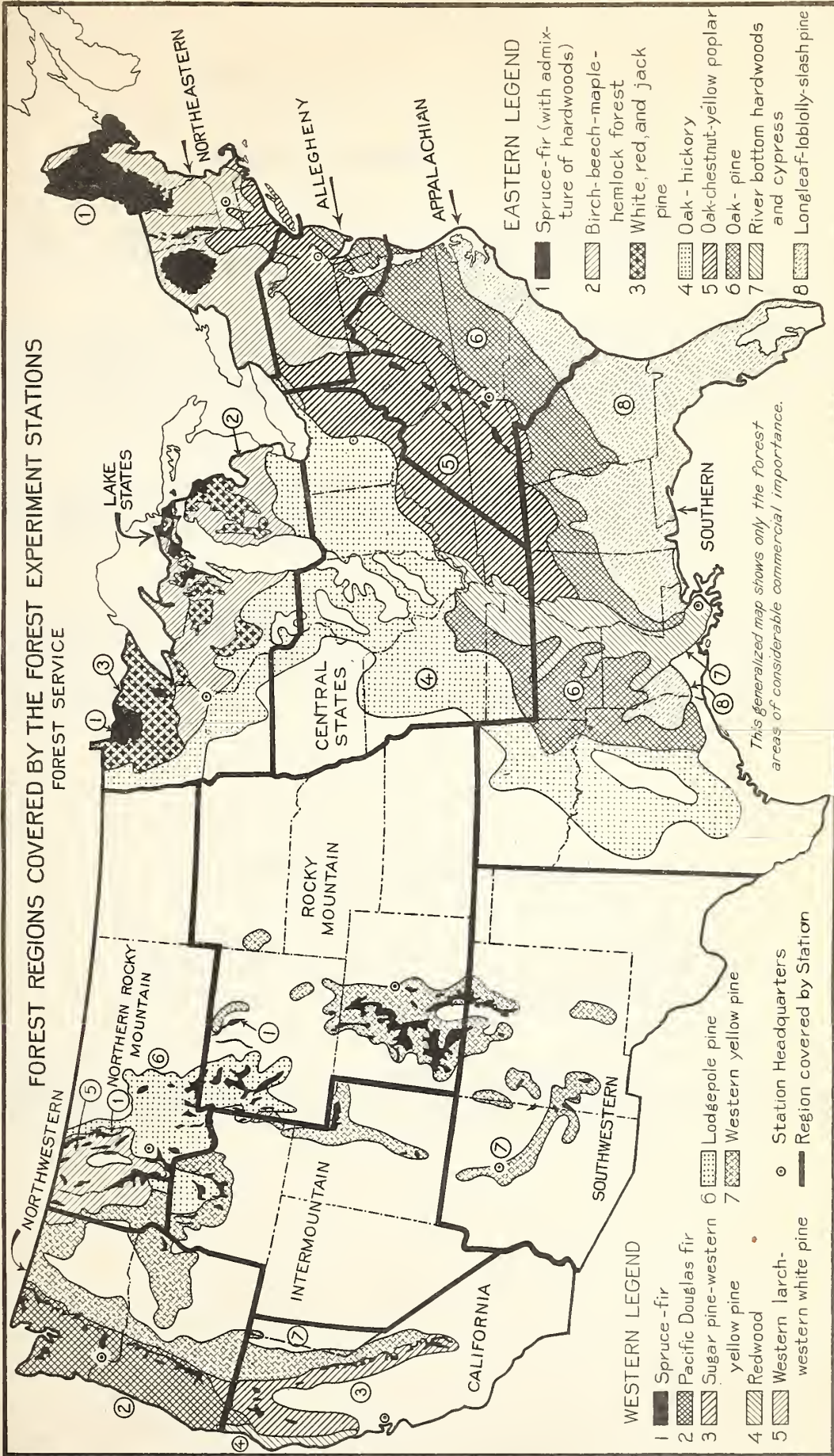
3. Sound economic forest land policies -- Federal, State, regional, etc. Enough information on our forest situation is now available so that we know along broad lines what action must be taken. Detailed policies can not be formulated satisfactorily until authentic and detailed data can be made available.

Forestry activities in the United States are expanding rapidly. Current expenditures by all agencies now probably reach over \$30,000,000 a year. Every dollar should be made to count to the utmost. This can be assured only through the sound technical basis which can be obtained only through research.

The forest research act outlines a 10-year financial program from 1929 to 1938. This plan was considered in detail by the Congressional Committees before the passage of the Act.

While as yet only partly in effect, the objective toward which the Forest Service is working is to place regional research in forest management, range research, the forest survey, and forest economics, and some of the purely local work in forest products, at regional Forest Experiment Stations, and to continue the Forest Products Laboratory as a national institution dealing with national utilization questions, those which require laboratory facilities, and the local products research which does not justify a permanent local staff. The attached map shows the territories to be covered by the regional stations.

FOREST REGIONS COVERED BY THE FOREST EXPERIMENT STATIONS
FOREST SERVICE



FOREST SERVICE (Continued)Changes in Language

New phraseology is submitted for the research items in the appropriation bill for 1931. The reasons for this are:

1. The McSweeney-McNary forest research Act approved May 22, 1928, is a codification and expansion of existing authority and in fact is an organic act for forest research. The appropriation items for research as now worded are based specifically on the Act.

2. All of the forest research appropriation items are a part of a single comprehensive program of forest research. An attempt has been made to make this clear through the form of the new phraseology.

3. In the consideration of the research items last year there was a good deal of confusion in relating the items in the appropriation bill to the appropriate sections in the McSweeney-McNary Act. It is believed that the phraseology recommended will prevent further confusion of this character.

(k) RESEARCH IN FOREST MANAGEMENT

Appropriation, 1930	\$413,000
Budget, 1931	473,000
Increase	\$60,000

The increase of \$60,000 is submitted for research in forest management under the authorization of \$1,000,000 provided under Section 2 of the Act approved May 22, 1928 (45 Stat., 699-702), as follows:

FOREST SERVICE (Continued)

(1) \$30,000 for research in forest management at the California Forest Experiment Station as follows:

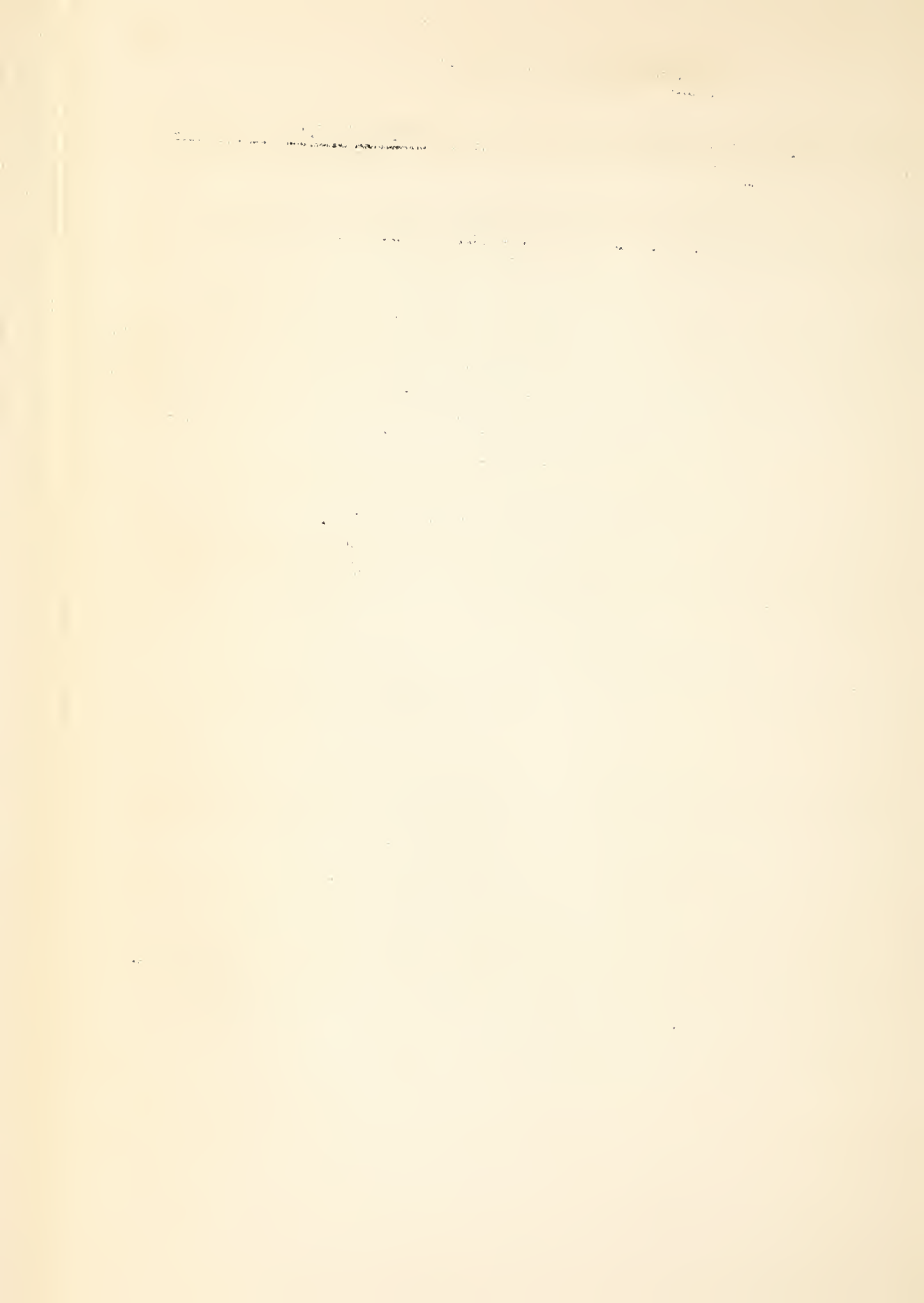
(a) \$20,000 to determine the best methods of preventing and suppressing forest fires. The work contemplated includes:

(1) A detailed analytical study by National Forests of all past fire statistics and of all other data bearing on the fire situation in order to perfect an organization which can prevent forest fires or suppress them while small. This involves, among other things, the best means of detecting and reporting fires, a better understanding of fire hazard as a basis for determining the number and best placement of men to make the initial attack on fires, the requirements of transportation systems which will reduce hour control to a minimum, etc.:

(2) A critical study of the behavior of going fires and of the effectiveness of different methods of suppression. This includes a study of the influence of different kinds of fuel, weather conditions, and topography upon the rate of spread of fires and upon protection technique, also investigations designed to stimulate the development of more effective equipment for fire suppression:

(3) The development of an experimental fire forest in cooperation with the administrative organization on which it will be possible to try out every known device that promises to improve fire prevention and control.

Fire is the greatest menace to keeping forest lands productive and to the maintenance of forest and brush cover for protection against erosion and for stream regulation. California is normally without rain over half of the year, and this taken with the mass of inflammable material in practically all forest types produces fire conditions of great severity practically every year. Emergency years from extremely unfavorable climatic conditions must also be expected--sometimes three or more in a decade. The phenomenal increase in automobile travel has taxed the resources of the protective organizations to the breaking point. Summer visitors to the California National Forests have in 15 years increased from 150,000 annually to nearly 10,000,000. An average of over 2,000 forest fires occur annually in California, of which over 1,200 are on the National Forests. In critical fire years over a million acres of forest



FOREST SERVICE (Continued)

and brush land have been burned, resulting in State and Federal expenditures of over \$1,000,000 for suppression and in damages exceeding \$1,000,000. One and one-half per cent of the important western yellow pine belt was burned over annually during the decade 1911-1920, and the percentage will probably be greater during the present decade. Four per cent of the brush fields were burned annually, destroying the forest reproduction which has been slowly restocking them to their original status of fine timber stands. Although Federal, State, and private forest agencies have made great progress in protection during the last 20 years, forests can not be grown under the high hazards indicated. One means for improving protection has been left practically untried, that of research. The purpose of this recommendation is to put forest fire research in one critical and important region on an effective basis.

(b) \$10,000 to determine the best methods of cutting and of reforestation for the California redwoods:

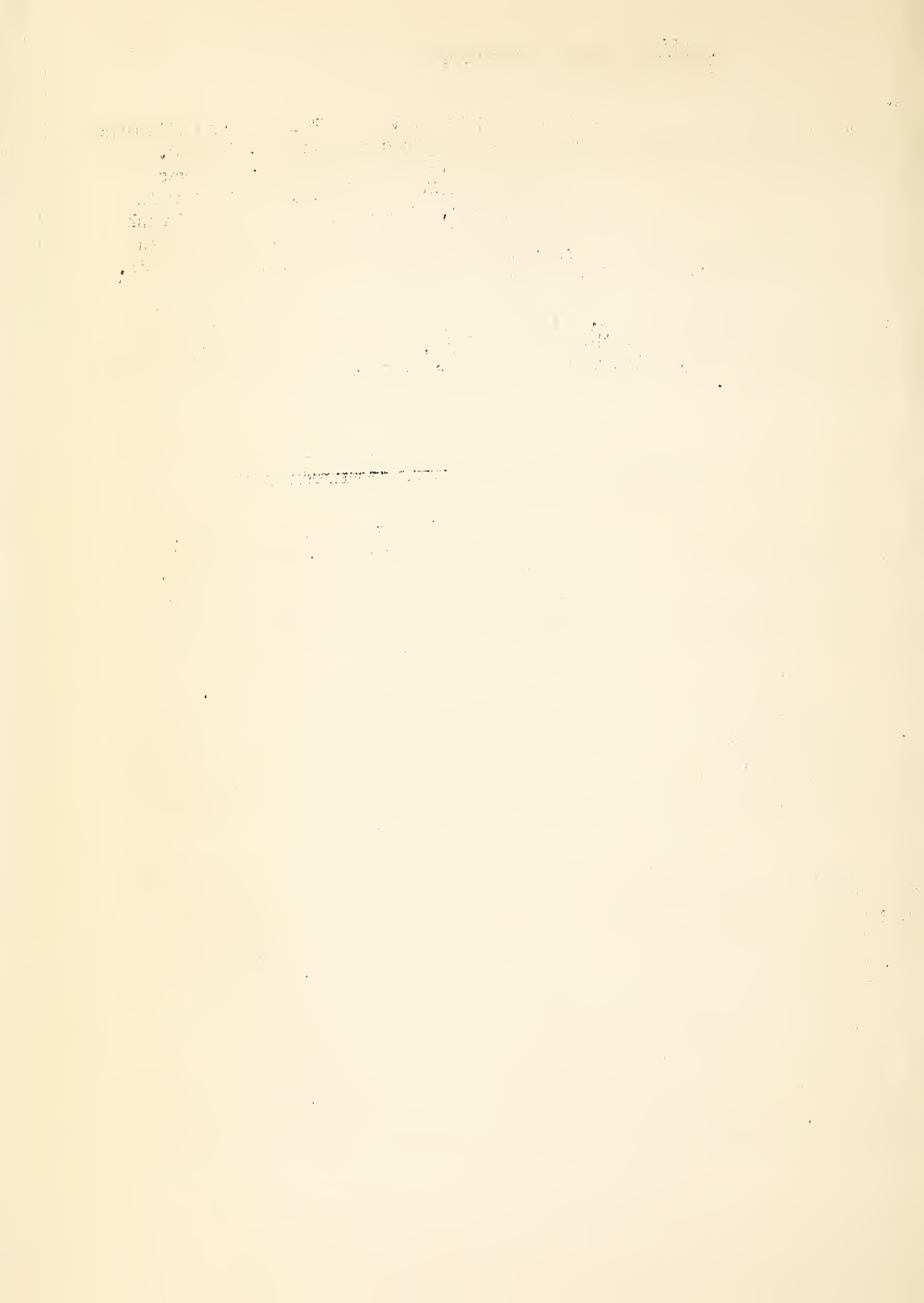
The redwood region is one of the most important in California. Its virgin stands exceed in volume any others in the world, averaging more than 50,000 feet per acre over the whole region, with single acres reported at 1,000,000 feet. The productive capacity probably exceeds that of any other region. Merchantable timber stands exceeding 150,000 feet per acre can be produced in less than 60 years.

A considerable part of the region has already been cut over. The heavy machinery used does serious damage, while the burning of logged areas to dispose of the enormous volume of bark and slash has also seriously damaged the productive capacity of the forest. The southern part of the redwood region particularly has suffered from fire following cutting and from erosion following both. Much of the land which could still support redwood forests is not wholly or partially devastated.

A larger proportion of redwood forest land ownership is committed to industrial forestry than in any other part of the United States. There is but meager knowledge to insure the success of this undertaking. The Federal Government is giving no assistance whatever. Research offers one of the most effective forms in which assistance can be given. Unless it is given, mistakes in method may lead to results which will discourage the entire movement.

Research under this increase should include:

(1) Determination of whether it is better to grow pure or mixed stands in the future. The present practice is to cut all species and to attempt to grow pure redwood stands through reliance upon sprouts and



FOREST SERVICE (Continued)

artificial planting. Forestry in the past is full of examples of disaster from the use of pure stands. While the redwood is particularly immune from disease and insect attack, further knowledge on the safety of present practice should be obtained.

(2) In connection with the preceding, the best methods of cutting to insure the natural regeneration of mixed stands should be determined:

(3) Methods of artificial reforestation. Planting is now going forward on a relatively large scale, but a number of problems have arisen which should be worked out through research;

(4) Methods should be worked out for the reforestation of the southern part of the redwood belt, which has suffered so severely from overcutting and fire.

(2) \$10,000 for research in forest management in the Intermountain forest region, and more specifically for the study of methods of cutting in the western yellow pine type:

Such an increase will make it possible to carry out the authorization of Congress in Section 2 of the Act of May 22, 1928 (45 Stat., 699-702), for the establishment of an Intermountain Forest and Range Experiment Station. It will make it possible to start work in a region in which no research in methods of timber growing is now under way.

The Intermountain region roughly includes the interior basin south of the Salmon River in Idaho and north of the Grand Canyon in Arizona. In this region are 26 National Forests with a total area of nearly 30,000,000 acres, constituting over 95 per cent of the total timberland ownership of the region. These National Forests have a total estimated stand of about 40 billion feet of timber, of which about one-third is western yellow pine, one of the most valuable of our western woods, and it is in this type that most of the lumber is produced. Some 3,000 timber sales of National Forest timber are made in this region annually, largely in the western yellow pine type, from which the returns to the Federal Government amount to over \$150,000.

Because of the values involved, the large area concerned, and the fact that these lands are in Federally controlled National Forests, it is important that timber cutting be carried on in such a manner as to leave the cut-over areas in the most satisfactory condition for reforestation. In the western yellow pine type, with its variable soil and climatic conditions, the methods employed have not always been successful in getting the desired reproduction and growth promptly.

FOREST SERVICE (Continued)

It is proposed, therefore, to make a study of methods of cutting. Such a study would involve questions of seed production, of the quick and ready identification of good seed-bearing trees, and of seed dissemination. It would be necessary to determine the factors which make for success in the establishment of the young seedlings, the influence of exposure, soil, and drought upon growth, the need for the disposal of slash resulting from logging, and the degree to which the new growth was influenced by the presence of the remaining stand. Information on all of these questions is important in getting satisfactory stands of timber following logging.

(3) \$20,000 for the initiation of two new lines of research in forest management at the Southern Forest Experiment Station, as follows:

(a) \$10,000 for investigations of the relationships between fire and resin yields in naval stores operation. The naval stores industry is second only to lumbering in the Southeastern States. It has a gross annual return of about \$60,000,000, employs some 35,000 people, and has a capital investment of \$40,000,000. The regions from which naval stores are produced extends over an area of 30 million acres, from North Carolina to Texas, in eight Southern States. From this region comes 70 per cent of the world's supply. About 40 per cent of the entire annual gum production comes from small operators, many of whom are farmers, and this class of operator is increasing.

It is customary in naval stores operations to rake around each treated tree and burn off the accumulated litter and grasses annually. Many of these fires are uncontrolled and result in the unnecessary burning of a large additional acreage. Large numbers of accidental or other fires also burn over a very large acreage annually. Repeated burning results in open stands through the gradual killing of established trees and through the prevention or destruction of forest reproduction. There is reason to believe also that burning reduces the yield of gum and is therefore detrimental instead of beneficial from this standpoint.

The purpose of the increase is to settle in an authoritative way the relationship between fires and naval stores production, a problem on which no work is being done at the present time. The investigation should include the direct and indirect effect of fires upon the vigor and life of the timber, their effect upon the formation and flow of gum, and finally, upon the total naval stores yields that may be obtained. If fire can and should be used as an agent the conditions under which it will be beneficial should be determined. If, however, it must be kept out of the woods entirely, the sooner this is known in an authoritative way the better. The results should be of immediate and practical benefit.

FOREST SERVICE (Continued)

Research on naval stores is under way in both the Forest Service and the Bureau of Chemistry and Soils. Under an understanding between the two bureaus, the Forest Service covers the forest or woods phase of naval stores work up to the time the resin is taken from the tree. The Bureau of Chemistry and Soils handles research on distillation, refinement, and uses of commercial products, that is, after the resin is taken from the tree.

(b) \$10,000 for investigations of methods of cutting to insure natural reforestation in second-growth yellow pine stands. The activities of the Southern Forest Experiment Station are concentrated on studies of growth and yield, planting, naval stores, and methods of cutting in mature stands. Nothing has been or is being done in methods of cutting in second-growth stands. A \$10,000 increase for methods of cutting in second growth would put this work on a basis of equality with similar work in old-growth timber.

That the size of the lumber cut in the South has held to its present level is due to the operations of small mills. According to recent estimates, nearly 50 per cent of the present southern pine cut of 11 to 12 billion feet board measure is from small mills and largely from second-growth stands. In fact, in some localities second-growth forests supply as much as 70 per cent of the lumber cut.

Cutting in young stands is often more destructive than in the old timber. Present-day markets absorb smaller sizes, broadcast burning of the slash destroys many of the trees that are left, and the young trees do not produce abundant seed crops since few of them are old enough or large enough. The percentage of the total cut from young stands will continue to increase rapidly as the old stands are cut out. It is becoming more and more essential therefore, that methods of cutting be determined for young stands which will insure reforestation by natural means.

An investigation of methods of cutting in second-growth stands would have to cover such subjects as the number and vigor of young trees obtained under different methods of cutting, the seed production of trees of different diameters, the number of trees required per acre to insure enough seed, the response in growth of trees left after cutting, methods of slash disposal upon the survival of reproduction, the influence of soil conditions, and other factors upon survival and growth of reproduction, and other questions which may be found to be needed for a solution of the problem.

Information of this character will be of value to all classes of timberland owners and among others to farmers who own a considerable percentage of southern timberlands. This recommendation is an essential part of a broad program designed to render substantial Federal assistance to the development of forestry in the South.

FOREST SERVICE (Continued)Project Statement

<u>Project</u>	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>	<u>Increase</u>
Research in forestry at Appala- chian Forest Experiment Station Asheville, N. C.	\$ 40,490	\$ 40,120	\$ 40,120	--
Research in forestry at Rocky Mountain Forest Experiment Station, Colorado Springs, Colo.	5,198	5,200	5,200	--
Research in forestry at Lake States Forest Experiment Station, St. Paul, Minnesota	37,312	65,773	65,773	--
Research in forestry at Pacific Northwest Forest Experiment Station, Portland, Oregon	29,529	28,920	28,920	--
Research in forestry at Northeastern Forest Experiment Station, Amherst, Mass.	28,419	28,420	28,420	--
Research in forestry at Northern Rocky Mountain Forest Experi- ment Station, Missoula, Mont.	20,774	20,247	20,247	--
Research in forestry at Southern Forest Experiment Station, New Orleans, Louisiana	47,926	52,250	72,250	\$20,000 (3)
Research in forestry at South- western Forest Experiment Station, Flagstaff, Arizona	9,900	9,900	9,900	--
Research in forestry at California Forest Experiment Station, Berkeley, California	33,979	34,300	64,300	30,000 (1)
Research in forestry at Central States Forest Experiment Station, Columbus, Ohio	30,363	30,510	30,510	--
Research in forestry at Allegheny Forest Experiment Station, Philadelphia, Pa.	31,139	31,220	31,220	--
Research in forestry, Washington, D.C.	62,373	66,140	66,140	--
Research in forestry at Inter- mountain Forest Experiment Station, Ogden, Utah	--	--	10,000	10,000 (2)
	<u>\$377,402</u>	<u>\$413,000</u>	<u>\$473,000</u>	<u>\$60,000</u>

FOREST SERVICE (Continued)Activities under this AppropriationGeneral

The present drain on our forests is approximately 25 billion cubic feet annually. Present growth is estimated at 6 billion cubic feet. If we are to have timber supplies adequate to meet national needs, a large part of this discrepancy must be made up by growing more timber on our own forest lands. The function of forest management research is to supply the necessary knowledge. To meet even present requirements we shall have to use intensively a large part, and probably all, of our 470,000,000 acres of forest land. This means the development of forest management for a very wide variety of climatic, topographic, soil, economic, and other conditions.

The American consumer has become accustomed to a very large number of forest tree species, many of which have special properties which adapt them to particular uses. It is desirable to perpetuate all of these species, but this means a very complex silviculture because no two species are alike in their requirements or their reactions to different climatic and other conditions. Furthermore, it is being found that many of our exceedingly large number of minor species have important functions in the development of forest tree stands of other species, relationships and interdependence which have grown up through long periods of association in the natural forest.

Under most forest conditions it is better to perpetuate our forests through natural means--ordinarily it is far cheaper and it results in much less disturbance of natural conditions--and this requires the removal of the old crop in such ways that new forests of desirable species are assured. Research to this end must therefore take an important place in the program of all of our Forest Experiment Stations. We have large devastated areas on which we shall have to depend on planting. The technical basis for this involves another important class of research which sooner or later will have to be covered by all of the Forest Experiment Stations. For every species and combination of species we shall want to know the yields which can be expected at different periods of years as a basis for management policy, and in the case of the private owner to permit an intelligent decision on the feasibility of timber growing. Finally, research in forest management involves protection against fires. With the large number of disastrous fires which we still have after great improvements in organization and technique, we shall have to resort to every possible means to meet the problem, including research. This is an attack of which as yet relatively little advantage has been taken. Highly specialized utilization, such as for naval stores, offers unusual problems and necessitates special forms of research.

FOREST SERVICE (Continued)Appalachian Forest Experiment Station. (For territory see map.)

Research in forest management at the Appalachian Station is largely upon the upland hardwoods, with main emphasis upon studies of cutting methods and natural reforestation, chestnut replacement, the growth of plantations, and forest fire damage. It has been brought out that the Southern Appalachian hardwood cut-over areas are badly understocked with good trees of desirable species and that the inferior and defective trees are preventing the development of valuable second growth. Where possible to make cleanings of the inferior species the desirable trees grow rapidly and promise to dominate the forest. A growth study of yellow poplar shows that the young stands grow faster than perhaps any other hardwood in the United States, on the best sites almost 1,000 board feet per acre each year. Studies of forest plantations indicate the possibility of artificial planting as a means of producing timber crops on badly eroded mountain lands in a relatively short time and the relative suitability of several species. Studies of forest fires have indicated great damage from even light ground fires. It appears that the damage can be appraised in terms of the percentage of the small trees killed, because of a rather definite ratio between the small trees killed and the damage to the older stand. Although in a recent study only 28 per cent of the trees showed evidence of fire damage, it was found when the logs were sawn into lumber that fire was responsible for 60 per cent of all defects. It has also become apparent that the destruction of leaf litter by fire may greatly change the physical structure and fertility of the forest soil and reduce its water-holding capacity. Limited work on natural regeneration following cutting in the loblolly pine forest is under way on the Coastal Plain. Other local studies include the germination and survival of oaks, and reforestation methods at high elevations.

Rocky Mountain Forest Experiment Station. (For territory see map.)

Only a small amount of forest management research is possible, since the investigative staff of the Station consists of one man. That under way deals mostly with methods of cutting and is of direct and immediate value in National Forest administration.

Lake States Forest Experiment Station. (For territory see map.)

The forest management research at this Station has been placing main emphasis upon cutting in the northern hardwood type, the effect of swamp drainage upon the growth rate of spruce, the growth of pine on sandy lands, and on forest fire protection. In the study of cutting methods it has been found that lumbermen were removing small trees at a loss and that only those 13 inches or more in diameter yielded adequate returns. This work has stimulated selective logging by a number of private owners. Studies in Minnesota showed that swamp drainage increased the growth rate of trees near the ditches by more than 100 per cent. It is therefore possible that some drained swamp lands will be more valuable for forest than for agricultural purposes. The volume and yield tables completed for jack pine give timberland owners information on the productivity of the sandy jack pine land. An analysis of the Minnesota forest fire records has determined the dangerous fire

periods, the localities most subject to fire occurrence, and other pertinent facts about the fire problem which have been of great help to State and other agencies. A special branch station for studying the effect of fire and methods of fire suppression is being developed in Michigan. Forest planting investigations show that reforestation is possible and feasible, and that the returns will be adequate on most of the 20,000,000 acres requiring planting in the Lake States.

The increased appropriation granted for the Station effective July 1 is being expended upon the problems of how to rehabilitate into productive forests of the original valuable species lands denuded by cutting and repeated fires. This involves such things as underplanting, the removal of the cover at the proper time to permit established reproduction to develop, etc. Considerable work is being done on the proper source of seed for reforestation so that long-time and costly mistakes in the use of poor seed may be avoided. One additional branch station and more than 40 sample plots have been established.

Pacific Northwest Forest Experiment Station. (For territory see map.) Forest management research of the Pacific Northwest has been confined to two important forest types. Most emphasis has been placed upon Douglas fir, with limited work upon western yellow pine and on growth, reproduction, and forest fires. Some significant results have been obtained on the reproduction of Douglas fir. Viable seed is released from the cones over a long period and flies up to a distance of 2,700 feet, much further than heretofore suspected. These findings may lead to radical modification of silvicultural practice, and already new methods of leaving seed trees are being developed for national forest cuttings. The absence of Douglas fir reproduction on many burned areas was found to be due to lack of shade and the presence of charred wood surfaces with temperatures as high as 160 . A beginning has been made on the growth of uneven-aged western yellow pine stands, which present many difficulties not found in even-aged stands. Attention has also been given to cutting methods to insure adequate natural reproduction in this type. Among other things in forest fires a study revealed how explosives could be used to fall snags, which are a serious fire menace, more cheaply than by any other methods.

Northeastern Forest Experiment Station. (For territory see map.) Forest management research at the Northeastern Station has been concentrated upon the spruce forests of northern New England and New York. The principal work has been on the growth of the spruce, methods of cutting to insure natural regeneration, and upon the protection from fire. The study of cutting methods shows that the most important factor is the presence or absence of sufficient young growth before logging, since "seeding-in" after cutting seldom produces satisfactory stands. A publication on the growth and yield of even-aged second-growth spruce and fir has been completed and should appear during the

FOREST SERVICE (Continued)

year, which indicates that on the best sites, spruce grows at the rate of a cord per acre per year up to 100 years. In the study of forest fire protection special attention has been given to determining the weather conditions which are responsible for the rapid spread of fires, and to an analysis of the forest fire data collected by the States. Reports have been published for Maine and New Hampshire and data are being compiled for Vermont and Connecticut. Minor activities of the Station include the girdling of hardwoods to release spruce reproduction, and the influence of soil conditions upon the establishment of the new forest.

Northern Rocky Mountain Forest Experiment Station. (For territory see map.) The forest management research of the Northern Rocky Mountain Station has been confined to the western white pine type. Chief activities have been upon the growth and yield of western white pine stands, upon methods of cutting that will insure natural reproduction of the desirable species, and upon forest fire hazard. Because of the difficulty of obtaining pine reproduction, much emphasis is placed upon the methods of cutting study. For example, the hypothesis that pine seed may lie dormant in the forest litter for many years and germinate after forest fires is being investigated among other ways by the storage in the soil of nearly 50,000 seeds. The growth of the western white pine type was shown to be much higher than anticipated. On the best sites the growth rate exceeds 1,000 board feet per acre each year, thus indicating that upon good sites it will be profitable to raise white pine in spite of added costs of protection against the threat of the blister rust. Investigations of the fire danger have indicated the great importance of the moisture content of fuels. A publication issued during the year presents the results of the work to date. Work was completed on three publications relating to research on nursery practice. Of considerable importance are the findings that zinc sulphate materially reduces nursery weeding costs, and nitrogeous fertilizers so stimulate the slow-growing Engelmann spruce that suitable seedlings for planting can be produced in four years instead of five.

Southern Forest Experiment Station. (For territory see map.) The research in forest management at the Southern Station is confined to the pine type, with major work on naval stores, the growth and yield of the important pines, nursery and planting practice, and on forest fire damage. The results of several years are being compiled into a comprehensive publication. The growth and yield studies have furnished the basis for sustained forest management for the four important pines by showing the volume, either lumber or pulp, that can be obtained from fully-stocked even-aged stands at different ages and on different sites. It has also been found that the growth rate is materially reduced by the frequently recurring ground fires of the southern pine region, that large amounts of reproduction even of longleaf pine are killed, and there is some indication that the use of fire in turpentine orchards decreases the flow

FOREST SERVICE (Continued)

of gum. Nursery and planting studies are furnishing methods for the reforestation of denuded lands. Other studies include methods of cutting to insure natural reproduction in old-growth stands and of the possibility of combining grazing with forestry on cut-over pine lands. Additional funds for new work available July 1 are being expended for a study of the yield of resin in relation to the density of the stand, to answer questions as to the degree to which resin flow is stimulated by thinnings and the ages at which thinnings should be made.

Southwestern Forest Experiment Station. (For territory see map.)

Research in forest management in the Southwest has been devoted almost entirely to the natural reproduction of the western yellow pine type. It has shown the importance of obtaining natural reproduction before cutting, and of logging practices to save the advance reproduction from destruction. If this is not done reforestation will not follow cutting for many years. A limited amount of work has been done on the growth rate of the western yellow pine.

California Forest Experiment Station. (For territory see map.)

Research in forest management at the California Station has so far been confined to the mixed conifer or pine types of the central part of the State and to the chaparral types of the southern part. The chief activities of the Station have been on methods of cutting to insure natural reforestation of the pine types, methods of planting, the mapping of the natural vegetative types of the State, and flood control and erosion. Work on the latter problem has shown forest litter to have a far greater significance than heretofore suspected. Surface run-off from litter-covered areas as compared with bare soils has been shown to be as high as 30 to 1, because the litter preserves the capacity of the soil to absorb water indefinitely, whereas the pores of the bare soil become clogged. Erosion has been shown to vary as much as 3,000 to 1 on litter-covered and bare soils. The maps of vegetative cover types are already invaluable for such purposes as fire protection, and have shown that the forests of the Sierras have been pushed back by cutting and fire since the advent of the white man on an average of 15 to 20 miles, and have been replaced by brushfields. Relatively small amounts of work are under way on such problems as forest fire protection, the thinning of young stands, etc.

Central States Forest Experiment Station. (For territory see map.)

Forest management research at the recently established Central States Station is centered primarily on farm woodlot problems. The principal studies under way cover: forest plantations, growth and yield of second-growth forests with particular reference to the oaks, and the grazing of woodlots. The plantation study is giving information upon the possible returns from the reforestation of idle and waste farm land, and the suitability of many tree species for woodlot and shelterbelt planting. As a result of the examination of over 150 plantations, it appears that native local species should be given preference.

It was also shown that black walnut plantations require thinning to maintain the best growth rate. The study of plantations, and that of the growth of young forests, will furnish data which will enable woodlot owners to determine how fast and what wood returns they can expect. The growth study involves 30 species, making necessary the preparation of about 150 volume tables which show the contents of trees in different units of volume at different sizes. Nearly 100 such tables have been prepared.

Allegheny Forest Experiment Station. (For territory see map.) This Station has three major projects in forest management research under way: a study of cutting methods in the Allegheny plateau hardwoods to determine how to obtain natural reforestation of the desirable species, yields of second-growth hardwoods, and a study of the silvicultural management of the Coastal Plain forests typical of southern New Jersey. A considerable portion of the initial work of the Station has been devoted to the preparation of volume tables which show the contents in cords and in board feet of lumber contained of trees of different sizes. Over 1,100 trees and nearly 50 sample plots have been measured to obtain data for this study. This is part of a general study made throughout the eastern United States to determine the growth of young hardwood stands in which the oaks are the dominant species.

Forest Research in Washington, D. C. The work in Washington includes the supervision of forest management research, the dissemination of results to farmers and timberland owners, and research, largely statistical. The supervision includes the work at the forest experiment stations, and the maintenance of library and atlas records and of a central computing and statistical force. Results are disseminated through the preparation of manuscripts for publication and through demonstrations to farmers and other timberland owners. A study is being made of the application of the newer statistical methods to forest research practices.

Intermountain Forest Experiment Station. (For territory see map.) Under the increase for 1931, it will be possible to establish the Intermountain Forest Experiment Station in accordance with the authorization of the Act of May 22, 1928 (Pub. 466, 70th Congress), and to undertake work already discussed in detail.

FOREST SERVICE (Continued)(1) RANGE INVESTIGATIONS

Appropriation 1930	\$67,000
Budget, 1931	85,000
Increase	<u>\$18,000</u>

The increase of \$18,000 is submitted for range research under the authorization of \$275,000 provided under Section 7 of the Act approved May 22, 1928 (45 Stat., 699-702), to be used as follows:

(1) \$10,000 to determine methods of restoring depleted winter or desert ranges in the Intermountain region. Research would be concentrated:

(a) On methods of restoring the depleted ranges by improving the stand of native forage plants or by introducing other valuable forage plants:

(b) On methods of range management which will maintain the productivity of the restored ranges.

The forage production of the winter or desert ranges of the Intermountain region has been reduced by overgrazing and other causes from one-half to three-fourths of the original production. This ~~is~~ true on an area of approximately 75,000,000 acres. The small amount of agricultural land available for forage crops necessitates the use of the desert range in the winter, the critical period for most of the livestock, which graze on National Forest and other higher ranges in summer. The depletion of the desert range by reducing the amount of the feed greatly increases the difficulty of handling National Forest ranges. The destruction of the more nutritious plants on the desert range forces livestock to graze poor quality plants. This causes annual death losses of from 6 to 10 per cent from starvation, malnutrition, lowered resistance to disease, and the increased grazing of poisonous plants. Calf crops are reduced to 50 per cent, which is inadequate for profitable production. Lamb crops are 20 per cent or more below possibilities. Costs of supplemental feeding are becoming progressively greater. The decreased vegetative cover has increased erosion, reduced soil fertility, and made restoration a difficult problem.

(2) \$8,000 of the proposed increase would be used in the establishment of a Southwestern Forest and Range Experiment Station. The first work proposed is to check the theory that damage to forest reproduction in the western yellow pine type results from a lack of water either from watering places or in succulent forage, and to work out the water requirements or other forms of range management necessary to prevent damage to forest reproduction and maintenance of a profitable livestock industry.

The western yellow pine type occupies approximately 6,000,000 acres in the Southwest, mostly in the National Forests. Livestock grazing in this type frequently results in damage to forest reproduction. Sometimes this damage is so severe that it prevents natural restocking for many years, or indefinitely. It is estimated that 550,000 acres are now in this condition in the Southwest. The damage, however, seems to be very irregular as between different parts of the Southwest and sometimes in the same parts from year to year. The first satisfactory explanation of this irregularity appears to be the theory that damage to reproduction results from lack of water.

Upon the solution of this combined forest-range management problem depends one of the main purposes for which the National Forests were established -- the growing of timber crops. The lumber industry ranks fifth among those of the Southwest and its future depends largely upon the timber grown upon the National Forests. The western yellow pine lands are the chief spring and summer range for the livestock of the Southwest and are therefore a vital factor in the maintenance of the industry, which ranks second for the region as a whole. The development of livestock watering places is very costly, and a proper understanding of the need for them is therefore a matter of great importance both to the livestock industry and in National Forest administration.

Research is needed --

(a) To check the theory of the relationship between damage to forest reproduction and the availability of water;

(b) To determine to just what extent succulent forage or artificial watering places, or a combination of the two, must be supplied to prevent damage to forest reproduction;

(c) To work out any other forms of range management which may be necessary to prevent damage and at the same time permit profitable livestock grazing.



FOREST SERVICE (Continued)Project Statement

<u>Project</u>	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>	<u>Increase</u>
Research on the growth of range forage and on its use by livestock consistent with the production of timber and watershed protection	\$ 52,450	\$ 67,000	\$85,000	\$18,000

Activities under this AppropriationGeneral

The object of range research is to determine how lands suitable for grazing can be used to best advantage, all things considered. Its results are sought primarily for proper administration of about 90,000,000 acres of national forests, but are applicable also in varying degree to about 735,000,000 acres of other range, public and private. Nearly half of the 470,000,000 acres of forest land in the United States is pastured. Nearly all of the great western range area will be used permanently for livestock pasturage. It is essential to learn not only how to maintain and increase its productiveness for this purpose but also how to preserve the often extensive watershed values that attach to these grazing lands, both timbered and untimbered, and both within and without the boundaries of the national forests. On such areas as the national forests, where timber production is the paramount objective, the correlation of grazing with timber production requires precise data obtainable through research. The range lands of the 11 far western states support a livestock industry worth nearly two billion dollars and produce almost 70 per cent of the feed utilized by the livestock. The productivity of national forest ranges has increased about 25 per cent in the last 15 to 20 years through regulation and the application of improved principles developed by research. The greater part of the range lands outside the national forests have steadily declined in carrying capacity and, on the average, are at least 50 per cent below their producing possibilities.

FOREST SERVICE (Continued)

Great Basin Experiment Station. The work of this station has until recently been concentrated in the central Wasatch Mountains near Ephraim, Utah. Primary emphasis has been placed upon methods of restoring depleted ranges in the high mountain meadows, the periods during which stock should be allowed to use the range so that vegetation will have an opportunity to perpetuate itself, and the carrying capacity of the range. These ranges were practically a dustbed in the late 90's, subject to severe erosion, disastrous floods, etc. Fifteen years of work at the Great Basin Station show that the ranges can be re-established to a satisfactory and valuable forage crop, which also reduces floods and erosion. Some areas now require only 2 1/2 acres to support a cow a month, as against 10 acres in 1912. This improvement has been accomplished largely by adjusting the degree and kind of grazing to the requirements of the valuable forage plants. It has been shown that proper use supports a more satisfactory stand of vegetation than total protection. Still another important activity has dealt with the effect of forage cover and grazing on erosion and streamflow. It has been shown that an increase in vegetative cover density from 16 to 40 per cent of the soil surface causes a reduction in summer surface runoff of 55 per cent and in sediment eroded of 56 per cent. The year's water supply from the areas studied was not materially affected, since 95 per cent of the surface runoff came from melting snow. Five per cent surface runoff from summer rains, however, carries 88 per cent of the sediment. Non-eroded soil has been found much more fertile than eroded soil. The work on erosion is being expanded into southern Idaho as a result of increased appropriations effective this year. Still another important activity which is made possible by an increased appropriation effective during the current year is the restoration and proper utilization of spring-fall ranges. The work is being done chiefly at the Federal Sheep Experiment Station at DuBois, Idaho, in cooperation with the Bureau of Animal Industry, but work is planned also for various parts of Utah. A bulletin on the proper management of browse ranges was issued during the past year, and one on artificial range reseeding is now in the editor's hands.

Santa Rita Range Reserve. The Santa Rita Range Reserve is located in southeastern Arizona with headquarters at Tuscon, and is typical of the gramma and other types of semi-desert range of that region. Work has been concentrated on methods of range improvement by natural revegetation, livestock management to insure the restoration of ranges, and carrying capacity. Experiments have shown that it ordinarily requires from three to five years of careful grazing or total protection to restore a moderately depleted gramma range, and considerably longer if the gramma and other valuable grasses have been killed out. The work indicates that a semi-

FOREST SERVICE (Continued)

desert gramma range can be maintained in as good condition with proper grazing as with total protection, if not better. The crucial point seems to be management which allows forage plants to make satisfactory growth during about six weeks of the summer rainy period when nearly all the year's feed supply is produced. Since 1915 the annual calf crop on the Santa Rita Range Reserve has been 73 per cent and the loss less than 4 per cent. In representative outside open range outfits the calf crop has averaged only 53 per cent with losses of 10 per cent. Yearlings from the Reserve have sold for about \$4 more per head than those on similar outside ranges.

Jornada Range Reserve. The Jornada Range Reserve is located in southwestern New Mexico, with headquarters at Las Cruces. It is typical of the semi-desert yearlong cattle range of that part of the West. The region is subject to severe periodic droughts. In 1916 the part reserved for fall, winter, and spring use showed four times the density of valuable grasses of that on the adjoining open ranges. The drought of 1921-23 reduced valuable plants on the Reserve to half of the maximum density and on the open range to 6.75 per cent of the maximum. Following another severe drought in 1925, two years of growth brought the Reserve range back again to its maximum, but the open range, although practically ungrazed for two good years, had failed to recover noticeably. The average calf crop for 10 years on the Reserve, including seven years of drought, was 65 per cent, with an average loss of 1.8 per cent, or a net production of 63 animals for each 100 cows grazed. On the adjoining open ranges the average calf crop was 50 per cent with a loss of 10 per cent and a net production of 40. Reserve cattle sold from \$2 to \$12 more per head. It has been shown that the correct utilization of bunch grasses is usually somewhat under 85 per cent of the foliage produced. Such grasses, if grazed closely two or even three times a season, are not ordinarily affected in yield or vigor provided the first grazing is late enough and the intervals are sufficient for the vegetation to recover from each cropping. Another important forage plant, tobosa grass, can better withstand continued close grazing, and wherever possible types in which this grass predominates should be used during the early grazing period, a time when it so happens this species is of most value. Black gramma, which predominates on large areas of the Southwest, can be easily overgrazed in the summer. It has been shown that in early July when new growth is about to start, grazing of the previous year's growth should leave not less than an average of about 2 inches of stem and basal leaf growth in the tufts.

FOREST SERVICE (Continued)(m) FOREST PRODUCTS

Appropriation 1930	\$585,000
Budget 1931	<u>635,000</u>
Increase	\$ <u>50,000</u>

The increase of \$50,000 is included for forest products research at the Forest Products Laboratory under the authorization of \$1,050,000 provided under Section 8 of the Act approved May 22, 1928 (45 Stat., 699-702), to be used as follows:

(1) \$15,000 for naval stores research. The general object of this work is to increase the yields and to reduce the costs of naval stores production. The specific object is to investigate the life processes, chemical and otherwise, which are responsible for the production of resin in southern pines, and of the relationship of these processes to wounding and production in naval stores operations. This would supplement work now under way on the microscopic structure of the wood in relation to resin production.

The United States for many years has been the greatest producer of naval stores. The present annual value of the turpentine and resin crop is more than \$60,000,000. The trees from which these commodities are obtained also furnish large quantities of lumber, railroad ties, pulpwood, etc. The virgin stands, hitherto the chief source of naval stores, are nearly gone and the industry must in the future depend on second growth. The past few years have shown that production and hence American leadership could be maintained and even increased by the proper management of fast-growing young forests which would utilize land not suited for other purposes. From being a by-product naval stores have become a primary product in the second-growth southern pineries, and in parts of the South have become essentially the key to private forestry.

The work on the relationship of microscopic structure to wounding in naval stores operations and to resin production has been of the greatest value in the determination of the height and depth and frequency of chipping which will produce maximum yields with the least damage to the tree. This indicates that equally or even more valuable results could be obtained if the life processes of the tree, chemical and otherwise, were understood so that naval stores operations could be so adapted to them as to produce maximum yields with least damage to the trees themselves. This work will require the services of a highly competent biochemist with techni-

FOREST SERVICE (Continued)

cal and other assistance. It is also proposed out of the increase to furnish assistance which will speed up the work now under way on the microscopic structure in relation to naval stores production. This work should encourage the practice of forestry in the South by making it more profitable to grow timber and particularly timber which could be used for such a key product as naval stores and thereafter for pulp or lumber or other forest products.

Research on naval stores is under way in both the Forest Service and the Bureau of Chemistry and Soils. Under an understanding between the two bureaus, the Forest Service covers the forest or woods phase of naval stores work up to the time the resin is taken from the tree. The Bureau of Chemistry and Soils handles research on distillation, refinement, and uses of commercial products, that is, after the resin is taken from the tree.

(2) \$10,000 to develop processes which will produce light-colored papers from Douglas fir, the use of which for this purpose is now negligible, and from other western species which are now being used to a very limited extent. An additional object is to reduce the enormous waste which characterizes present-day lumbering on the Pacific Coast. Still another important object of pulp and paper work with new species is to aid in making the United States independent of foreign sources. The United States consumed nearly 12 million tons of paper in 1926, an increase of approximately five times over 1899. Per capita consumption in the same period increased nearly four times, to more than 200 pounds. During this period, however, the amount of paper or its raw materials imported from other countries increased from 23 to 60 per cent of our total paper consumption. The Pacific Coast region offers very large timber resources and other great natural advantages such as tide-water transportation for the establishment of a large-scale pulp and paper industry.

Douglas fir is a very different wood from other species, both physically and chemically. The little research done has gotten nowhere. The fibers are coarse and require different processing. Three general lines of attack are first contemplated:

(a) An attempt to apply the bleached sulphite process recently worked out for southern pines:

(b) To modify the base of the sulphite process so as to overcome the difficulties known to exist with the usual commercial sul-

phite reagents:

(c) To obtain fairly light-colored strong pulps by applying the semi-chemical process which employs neutral agents under high pressures for high yields.

(3) \$10,000 to investigate the chemical and physical properties of wood lignin in order to lay the foundation of basic knowledge in the United States for the utilization of lignin and also for the more intelligent use of wood. The work will be initiated by studies of the chemical composition and physical properties of lignin and the determination of how they affect the properties of wood.

Lignin constitutes nearly one-third of the weight of the wood. It is wasted in the manufacture of chemical pulp and in the case of sulphite pulp it is responsible for stream pollution. Approximately 1 1/2 million cords of lignin were wasted in manufacturing the chemical pulps required by the United States in 1926. Notwithstanding these losses, the chemical composition of lignin is practically unknown.

Much research has been done upon cellulose which forms about two-thirds of the wood. The rayon industry is based primarily upon cellulose research done in England. The lacquer and film industries are based on more recent research on cellulose. Similar research on lignin might lead to the development of other new industries. A knowledge of the chemistry of lignin should open the way to the prevention of wastes such as in pulp making and to the effective utilization of sawdust, etc. Foreign chemists are beginning to study lignin, probably because of the belief that great industrial developments lie ahead for the country that first understands its complex chemistry.

In its physical aspects lignin also has an important influence on the mechanical properties of wood. Since it has not been possible to separate lignin from wood in unchanged form, it is not known in what way it affects such physical properties of wood as strength and shrinkage. It must have a large influence, since it cements the wood fibers together. Any research on the determination, control, or modification of the physical properties of wood would therefore be greatly assisted by information on the properties of lignin.

(4) \$15,000 for investigations of ways and means to improve the use of wood in small houses and other frame buildings.

Wood is the standard structural material for rural and small urban houses and other buildings. Some 20 to 40 per cent of the annual lumber cut is used for such purposes. It is estimated that the nation has some \$12,000,000,000 worth of farm buildings alone,

From the standpoint of lower maintenance costs, appearance, and permanence, however, a large portion of frame buildings of all types fail to give entire satisfaction. Too often inadequate resistance to storms, poor paint service and decay in all types of frame structures, plaster cracks, shrinkage of floors and finish and high fuel costs in houses, and sagged roofs and skewed walls in farm structures are directly traceable to poor selection, preparation and care of lumber, poor design, and poor construction methods. The art of designing and constructing frame houses and farm buildings is largely based on tradition and carpenters' judgment. Such work as has been done has been confined to the holding power of nails, wall construction details, and a very limited amount of work on the painting and moisture-proofing of wood.

Tests have shown that diagonal sheathing on the wall of a frame building is very much superior to horizontal sheathing. The effectiveness of various styles of bracing in horizontally sheathed walls has been determined, and the importance of using seasoned lumber has been demonstrated. Plastered wall panels were also tested and the strength and rigidity added thereby was determined.

Efforts in the immediate future will be directed specifically toward farm structures. From the standpoint of design a survey to ascertain the extent to which existing farm structures might profitably be repaired and improved should be made. Following this, demonstrations of how this work could cheaply be done should be made on selected structures in different parts of the country. In effect this means finding out what causes one out of three barn roofs to sag, for example, and then to demonstrate how the difficulty may be remedied and the life of existing structures prolonged. Following that, tests should supply the construction details essential to permanence and low repair costs. Because the dairy barn is the largest single item of farm building investment except the house, and because in dairying there is the most need for good buildings, and because the dairy barn best admits of standardization in size and arrangement, the work would start with it.

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A study would also be started of the causes of and the remedies for the blistering and peeling of paints and of methods of increasing the adhesion of paint to the commonly-used woods on which it now fails too soon,

Project Statement

<u>Project</u>	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>	<u>Increase</u>
Forest products investigations at Forest Products Laboratory, Madison, Wisconsin	\$450,291	\$479,000	\$529,000	\$ 50,000
Forest products investigations in Rocky Mountain region, headquarters Missoula, Mont. . .	14,699	15,000	15,000	-
Forest products investigations in the Pacific Northwest, headquarters Portland, Oregon.	18,159	18,520	18,520	-
Forest products investigations in California, headquarters Berkeley, California	12,993	17,200	17,200	-
Forest products investigations and administration, Washington, D. C.	<u>45,740</u>	<u>55,280</u>	<u>55,280</u>	<u> </u>
Total	\$541,882	585,000	635,000	50,000

FOREST SERVICE (Continued)Activities under this AppropriationGeneral

The aim of forest products research is to aid in making timber growing profitable through more efficient utilization and to aid in providing the public most economically with needed forest products. The enlargement of merchantable yields, the utilization of waste and of species now considered inferior or worthless, and the development of new uses and improved practices is involved. The determination of the chemical composition and physical structure and properties of all species is required, of how these are affected and may be controlled by the conditions of growth, and of how the material may be most efficiently harvested, selected, prepared, modified, adapted to service, and converted into usable by-products.

Wood consists of cellulose, lignin, pentosans, extractives, and water arranged in intricate cellular structure. This arrangement determines the properties; such as strength, hardness, durability, workability, etc., of every piece of wood. These properties in turn determine how suitable and how valuable any piece of wood is for any use. Much of the past and current work of the Forest Products Laboratory lies in this field.

Forest Products Laboratory

Chemical Composition, Physical Structure, and Properties. Work on chemical composition has been largely devoted to determinations of the amount of cellulose, lignin, pentosans, and extractives in different species, but recently the chemistry of these constituents, their location in the wood structure, and their effect on properties have been studied. The composition as well as the amount of crude cellulose determines the pulping qualities and the location and amount of lignin affects the strength. The extractives vary more than the other constituents and account for many desirable properties such as durability, color, and odor, and undesirable such as staining and corrosion. The fine microscopic and submicroscopic structures of the cell walls, for the study of which the proper technique has only recently been developed, determine not only the mechanical properties and shrinkage but also the ease with which the wood may be dried or impregnated. These correlations of composition and structure with properties are all recent and give promise of great improvements in the efficient use of wood. To a large extent variations in composition and structure of wood are due to the tree species, but there are some variations within a species which it should be possible to control. It has been found that an important structural property, density, depends largely on the spacing

FOREST SERVICE (Continued)

of the trees, and there is great promise of extending this discovery to other properties and other growth conditions. Wood has many properties directly related to the requirements for its many uses. It is therefore necessary to determine the average and range of each property for each species in order properly to select woods for use. Much work of this kind has been done and very complete information is now available on the main mechanical properties of the virgin growth wood of the important commercial species. A report based upon 500,000 tests has been completed and submitted for publication. It presents the mechanical properties of 164 species in form and language adapted to practical wood users. Studies so far made do not show the variability of those properties and what causes it, and little work has been done on second-growth material.

Harvesting the Material. Great wastes in all species and regions occur in logging and lumbering. Laboratory work in this field has, in cooperation with the Forest Experiment Stations, shown that it is unprofitable to harvest for lumber Lake States hardwoods less than 13 inches D. B. H., Arkansas pine less than 14 inches, and Appalachian hardwoods less than 12 to 14 inches, and that if unprofitable trees were left they would form a nucleus for a new crop. It has also been shown that in the Appalachian hardwoods fire is responsible for three-fifths of the total defect and that National Forest stumpage is worth from \$1.60 per M for basswood to over \$17 per M for red oak. Similar studies are now under way on southern and California pines, on improved practice in small sawmill operations, on methods for the conversion of woods and mill waste into small dimension stock, etc.

Selection of Material. Every species varies considerably in each of its 30 or more properties. Intelligently employed, this variability will extend the uses of wood; disregarded, it is a handicap. For example, uniform strength is important for structural uses, shock resistance for auto bodies, durability for sash and frame, heat insulating for siding and sheathing, hardness for floors. The Laboratory has shown that density is an index to many of these properties and work is under way to develop practical means for the segregation of wood on a density basis.

Visual defects, such as knots, checks, pitch pockets, and stain also effect the suitability of wood for many purposes. Intensive studies are under way to determine the size, quantity, and frequency of such defects, by species and regions, in order that lumber may be selected to meet use requirements more efficiently.

Preparation of Material. Moisture variation seriously militates against the efficient use of wood. Properly controlled, swelling, shrinking, cupping, and decay in service would be eliminated; and seasoning losses would be reduced. The Laboratory has already accomplished much in establishing the principles for sound seasoning

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practice and for their practical application; work is under way to improve the storage and handling of lumber from mill to ultimate user; how it may be seasoned and maintained at any desired moisture content; and what that moisture content should be for different regions and purposes. Significant progress is being made in developing apparatus for the instantaneous determination of the moisture content of lumber and of wood in service.

Modifying the Material. Changing the properties of wood by preservatives, paint, glue, etc., is an important activity. How to increase decay resistance and inflammability has necessitated studies of the efficiency of preservatives and how to inject them into the wood; as well as the development of tests to evaluate their efficiency. That the railways of the country now require 25 per cent less ties for renewals than 20 years ago is tangible evidence of the value of this work; more recently it is helping the Forest Service to dispose of Engelmann spruce and other species in the Rocky Mountains by showing how they can be efficiently treated against decay. Considerable progress has been made in developing a standard method for testing inflammability.

In the paint field, more recently attacked, it has been found that two-thirds of the softwood lumber cut is of species on which paint fails readily, and the study has indicated that the outstanding problem in making paint last longer on wood lies in finding a way to make it cling to dense summer wood. With glues, extensive work has been done to develop water-resistant adhesives and to improve practice and methods in the diversified field of glued wood products, and a comprehensive report summarizing results to date was published during the year.

Adapting the Material to Service. The testing of actual construction will do much to improve the use of wood through better design. In this extremely wide field the Laboratory has started with strength tests of full-size wall panels and other house parts. The work thus far points to many improvements in design that will result in greater rigidity, storm resistance, and economy of material.

Ten per cent of our annual lumber cut goes into shipping boxes and crates. Efficient design for such containers has been studied for several years. A comprehensive treatise on the principles of construction is ready for the press. Another publication shows how knotty lumber can be used in boxes. In boxes with short, thick sides knotty lumber actually gives a more efficient and better balanced container than clear lumber because it springs enough under rough handling to relieve the nails.

Where and how damage occurs to goods in freight cars and how containers can be best built to meet the hazards are now being studied.

FOREST SERVICE (Continued)

Conversion of Material into Pulp and Other Products. How to utilize for pulp a wide variety of species in several forest regions is a major Laboratory problem. Better land use, more complete utilization, and less dependence on foreign countries for paper and pulp are at stake.

Strong white paper has been made from southern loblolly pine, and efforts to duplicate commercial white paper grades and to use long-leaf pine are under way. The duplication of commercial strong, light-colored papers from hardwood sulphite is proceeding successfully. Commercial print, wrapper, and Manila papers have been duplicated by the semi-sulphite process with eastern hemlock, balsam fir, aspen, and black gum.

Agricultural Wastes. The possibility of developing a commercially feasible process for the development of a strong white pulp from threshed seed flax straw and from hemp now appears promising, owing to the discovery of means for cheap mechanical separation of the long valuable bast fiber from the shive.

Office of Forest Products, California Forest Experiment Station

The main purpose of this office is to conduct local forest products investigations which will aid directly in National Forest administration and in the development of industrial forestry. The efforts of the staff are now being devoted primarily to a comprehensive woods and mill scale study to determine, among other things, the diameter below which trees of various species in the California pine forests can not be logged and manufactured at a profit. An increase in appropriations for the fiscal year 1930 is being expended on this study. The data should pave the way for a determination of the feasibility of selective logging in industrial forestry and be of material aid also in National Forest appraisals and silviculture. Other work includes such things as: ways and means of preventing bluestain in western yellow pine and sugar pine lumber, and a study of the properties and defects of white fir, now ordinarily wasted by being left in the woods, in order that objections to its cutting and use may be overcome. The office has recently cooperated in one of the most intensive studies of preventing marine borer damage that has ever been made, involving service records on some 200,000 piles in San Francisco Bay, and a large number of preservative materials and processes. The findings indicate that untreated wooden piling will be destroyed in six to eight months in places where borer attack is severe, and that a life of 15 to 20 years may be expected from properly treated Douglas fir. Most of the attack on creosoted piling by marine borers appears to have begun in spots where the treated outer shell was broken through in handling.

FOREST SERVICE (Continued)Office of Forest Products, Portland, Oregon.

The main purpose of this office is the same as for the California office. The two principal projects under way are:

(a) A series of woods and mill scale studies on western yellow pine to determine the yields of lumber by grades from trees of various diameters, and the costs of production. This information will show profit or loss, and will determine the diameter below which western yellow pine trees in this region cannot be cut profitably;

(b) A survey of wood waste in the Douglas fir region. This study was carried on in 24 lumber camps in Washington and Oregon. It showed that there is left after logging on the average acre about 21,000 board feet of sound wood of cordwood size or larger. This for the entire region would amount to over 3 billion feet log scale, or nearly one-tenth of the annual lumber cut of the United States. Following this inventory, a constructive study of how to reduce the losses in felling and bucking Douglas fir is being made. The waste survey has been especially timely in connection with the present demand for wood waste for pulp making. Other work in the Portland office includes a survey of mill waste in the Douglas fir region, a study of air seasoning, a study of the possibilities of making more use of bigleaf maple, and the collection of statistical information on production and prices of various forest products in the Northwest.

Office of Forest Products, Missoula, Montana

The main purpose of this office is the same as for the California and Portland offices. One of the important projects under way is a woods utilization study. The woods waste survey portion of the project will be completed in 1929. It consists of an inventory of the material left after logging in the western yellow pine, larch-fir, and lodgepole pine types. The project will include studies on breakage in felling and losses in gravity chuting. Another comprehensive project is a series of sawmill studies. These include the relative cost of manufacturing lumber from logs and trees of different species, sizes, and degrees of defectiveness and the value of the product produced, the efficiency of different types of equipment and methods of sawing, the depreciation in fire-killed western white pine timber during the first and second year after the burn, etc. Taper sawing was found to be preferable to the common practice of sawing parallel to the center line of the log. In eight mills the best method of taper sawing showed \$11.02 higher profit per thousand feet log scale. Five trade journal articles on this work have been published. Other work of the office includes a study of further possibilities in the use of lodgepole pine, a common national forest species, the inspection of treated test material in service, and the collection of sta-

FOREST SERVICE (Continued)

tistical information on the production and prices of forest products in the Inland Empire.

Office of Forest Products, Washington, D. C.

This office cooperates with the Forest Products Laboratory and with other products offices and various departments of the Government such as the Bureau of the Census, in the collection and compilation of statistics on the production and consumption, distribution, and price of lumber and various forest products. The Washington office also assists the Federal Specifications Board, the General Supply Committee, the Federal Purchasing Board, and other Government agencies in the selection and purchase of lumber and other forest products for Government use. Field studies are made dealing with the utilization of particular species and reports compiled dealing with the various phases of wood utilization. A large amount of information is furnished to the public by correspondence and through personal calls.

(n) FOREST SURVEY

Appropriation, 1930	\$40,000
Budget, 1931	125,000
Increase.....	\$85,000

The increase of \$85,000 is submitted for a comprehensive forest survey of the United States under the authorization of \$250,000 annually, provided by Section 9 of the Act approved May 22, 1928 (45 Stat., 699-702), as follows:

(1) \$50,000 to expand the work begun in the Pacific Northwest during the current fiscal year as a part of the activities of the Northwestern Forest Experiment Station. The survey will make a comprehensive and detailed appraisal of the Nation's present and future requirements for forest products, present and potential growth, existing volume and quality of timber, and the area and condition of forest land. It is designed to lay a broad foundation of facts as a basis for sound economic forest land use in the United States. It is designed to supply the detailed facts necessary to balance our national timber budget. It should greatly stimulate the development of private forestry. The Pacific Northwest, including Oregon and Washington, was selected for the initiation of the Forest Survey because of the importance of the forest problem to the region itself and its critical bearing upon the advancement of forestry throughout the United States. More than two-fifths of our remaining stand of virgin timber and one-third of the national lumber cut is in these States. Stumpage estimates vary by as much as 150 billion feet. Upon such things as the volume of stumpage, its accessibility, the probable duration of cut at the present rate, and the possibilities of continued shipments to other regions, reliable information is urgently needed. Having started the

FOREST SERVICE (Continued)

work there it is essential as a matter of efficiency and from the standpoint of local and national needs as well to provide for its aggressive prosecution.

(2) \$25,000 for the initiation of work in the southern hardwoods region, particularly the bottomland hardwoods, as a part of the activities of the Southern Forest Experiment Station. While less has been known about southern hardwood resources than those of any other part of the country, it has been thought that the bottomlands contained large hardwood reserves, the last, in fact, in the United States. A recent preliminary inquiry by the State of Louisiana indicates that the amount of timber is only a small part of what it was thought to be. It discloses in startling fashion the rapidity with which this hardwood timber is being cut out and lack of adequate measures to perpetuate it. The perpetuation of the southern hardwood forests is of vital importance to the region itself and to the whole country, because from them we are now deriving approximately one-third of our hardwood cut and on them we shall have to depend for a corresponding percentage of our permanent future supplies.

(3) \$10,000 for cooperative assignments with outstanding, closely-related State surveys. It is important that these be coordinated with the national survey in order to insure the maximum effectiveness of both. Michigan, Wisconsin, and Minnesota already have under way or immediately in prospect comprehensive land inventories or economic surveys. California is planning another, and other States are in various stages of preparation or execution.

The forest survey is one of the most far-reaching undertakings in the field of forestry. In a large sense it will supply the foundation for national, regional, and industrial progress in forestry. Its value will depend to a considerable extent upon the speed with which the entire country is covered.

Project Statement

<u>Project</u>	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>	<u>Increase</u>
Forest Survey	-	\$40,000	\$125,000	\$85,000

Activities under this AppropriationGeneral

The forest survey, for which the initial appropriation became available on July 1, 1929, contemplates a comprehensive inventory of the forest resources of the United States. It involves the collection,

FOREST SERVICE(Continued)

coordination, and compilation of facts as to the quantity, kind, and location of existing timber supplies, the rate of depletion through cutting, fire, disease, etc., the rate at which new supplies are being created through growth, the potential growing capacity of our forest land, and the present and prospective requirements for timber and other forest products. It involves also the collection of such other data as may be necessary to balance our national timber budget and as a basis for forest policies, national, regional, State, etc.

Washington, D. C. One point of attack on this problem is to obtain a much better conception of present and probable future requirements for wood in the United States. Nearly 30,000 questionnaires have been sent to manufacturers, etc., who use lumber and wood in other forms in order to get at the detailed requirements for different uses. This procedure will be followed over a series of years in order to get data on trends. The work is being done in cooperation with the Bureau of the Census and the National Lumber Manufacturers Association.

Lake States Forest Experiment Station. The Lake States Forest Experiment Station is cooperating actively with Michigan, Wisconsin, and Minnesota, all of which have under way or are initiating State land economic surveys or inventories. The Forest Service is acting both in an advisory capacity to the State organizations in this work and is giving actual help in the collection of field data.

Northwestern Forest Experiment Station. The bulk of the work during the year will be concentrated in the Douglas fir region of the Pacific Northwest. These States possess a very large proportion of the remaining virgin timber, and an accurate knowledge as to the extent and probable duration of the supply is especially important in planning forest policies for other sections of the country. The work so far has involved the recruiting of a staff, the preparation of detailed plans, arrangements for cooperation, etc.

FOREST SERVICE (Continued)(c) FOREST ECONOMICS

Appropriation, 1930	\$25,000
Budget, 1931	<u>50,000</u>
Increase	<u>25,000</u>

The increase of \$25,000 to study practical measures for speeding up the practice of forestry on privately owned lands and stopping forest devastation is submitted under the authorization of \$250,000 provided by Section 10 of the Act approved May 22, 1928 (45 Stat., 699-702). The proposed investigation would undertake:

(a) To appraise the extent and progress of private forestry, about which there is now wide difference of opinion;

(b) To determine the phase or phases of lumbering operations in different forest regions, which are specifically responsible for forest devastation, and to formulate practical remedial measures;

(c) To study the status of private forestry in European and other countries, and the conditions with respect to governmental regulation and other factors which lead to private forestry; and

(d) To devise rational measures lying beyond present forms of cooperation which offer practical opportunities for speeding up the development of private forestry.

The policy of encouraging private forestry through Federal cooperation with the States in fire protection, and otherwise, has resulted in extending forestry upon private lands. An increasing number of farmers and others are maintaining their forest areas in reasonably effective production, but the total area involved is relatively small. Superficial canvasses have indicated that on possibly 8,500,000 acres of industrially owned land more or less intensive and effective steps are being taken to assure continuous or improved production. This is a little more than 2 per cent of the forest land in private ownership. Forest destruction continues in far too large a proportion of logging operations. Unfortunately, after giving the fullest credit to private owners for their efforts, the progress so far made does not begin to offer assurance that the nation's future requirements for forest products will be supplied at reasonable costs; or that our primary and secondary wood-using industries, with an invested capital of \$3,500,000,000, annual production valued at over \$4,500,000,000, and over a million employees, can continue to exist after the virgin timber is gone; or that the one-fourth of our total land area which is adapted only to forest production will be kept in productive use. Since 80 per cent of the forest land in the United

FOREST SERVICE (Continued)

States is privately owned and in the future we shall need all the timber which can be grown on all of our forest lands, the public is vitally concerned that there be no unreasonable delay in bringing private forest lands into productivity, and equally, that forest devastation be stopped. The proposed investigation is designed to strike at the heart of these two public needs.

Project Statement

<u>Project</u>	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>	<u>Increase</u>
Investigations in forest economics	--	\$25,000	\$50,000	\$25,000

Activities under this Appropriation

The field of forest economics as provided for under Section 10 of the McSweeney-McNary Act is very broad and in fact includes the important problems in the economics of forest land utilization and forest production, etc., not specifically covered in the Clarke-McNary Act (forest taxation and forest insurance) or in Section 9 of the McSweeney McNary Act (forest survey). Among other lines of research than that already under way is that recommended for 1931 on ways and means of stopping forest devastation and speeding up the development of private forestry, the future use of wood in the United States with particular reference to the substitution of other materials, utilization of land for forestry in its relation to other forms of land use and especially agriculture, the place of forests in national and regional economy, etc.

An appropriation became available on July 1, 1929 for a study of the financial aspects of private forestry practice. The purpose of this study is to ascertain the conditions under which forestry is now profitable in the United States. It involves the investigation of the costs of forestry practice under various conditions, and of the returns that are being received or may be expected. It will include an analysis of actual enterprises and a study of the various elements of cost and the factors influencing costs and returns in different regions. So far as possible the study will be made a constructive aid to the development of private forestry. The study is being undertaken during the current year in the southern pine region as a part of the activities of the Southern Forest Experiment Station. The relation between timber growing and agriculture is very close in most of this region, where a large proportion of the growing timber is on woodlands owned by farmers and where a considerable portion of the farmer's income is derived from products of woodlots. Considerable attention will be devoted to naval stores, because these products seem to be the key to forestry in the Southeastern States.

FOREST SERVICE (Continued)(p) FOREST FIRE COOPERATION

Appropriation, 1930	\$1,400,000
Budget, 1931	1,700,000
Increase	\$ 300,000

The increase of \$300,000 is submitted for the following purposes:

(1) \$295,000 to increase the allotments to the states for fire prevention and suppression on State and private lands.

This increase would be used to effect increases in allotments to the States as shown in Table No. 1 (which follows).

The basic need for increased financial support of these projects is to extend protection from forest fires to the vast areas of now unprotected land, and to intensify the protection of areas now inadequately covered.

An increase is needed to enable the Federal Government to more nearly carry out its part of the Clarke-McNary program with the cooperating States and private owners. Assuming that 75% of the job of protection belongs to the State and private owners and 25% to the Federal Government (the generally accepted policy upon which the amount of the present authorization in Secs. 1-3 of the Clarke-McNary Law was based) the States and private owners are in the Fiscal Year 1930 shouldering approximately 57% of their responsibility and the Federal Government 48% of its responsibility. With a \$295,000 increase, and on the basis of the 1930 set-up of State and private expenditures, the Federal Government would be meeting its responsibility to approximately the same degree as the States and private cooperators.

(2) \$5,000 for Forest Taxation Inquiry. An increase of \$5,000 is recommended in the allotment for the Forest Taxation Inquiry, to increase the total from \$65,000 to \$70,000. This project is authorized by Section 3 of the Clarke-McNary Law, as amended (43 Stat. 653).

This small increase is needed to provide additional clerical-statistical personnel and to permit some increase in travel. This minor expansion is necessary to handle the growing volume of statistical computation and analysis, and to enable the investigation, as a whole, to proceed effectively.

FOREST SERVICE (Continued)Project Statement

<u>Project</u>	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>	<u>Increase</u>
Cooperation with States in forest fire prevention and suppression and the study of the effect of tax laws and timber insurance	\$1,208,024	\$1,400,000	\$1,700,000	\$300,000

Activities under this AppropriationCooperation with States in forest fire prevention and suppression.

In the Fiscal Year 1930 the Federal Government is assisting 38 States in their forest fire protection programs, embracing educational work aimed at the prevention of forest fires, and the necessary machinery for the detection and suppression of such fires as get started. Each State project operates as a separate unit, the work being organized and directed by the State Forestry Department in each case. In the calendar year 1928, 40,579 fires were handled by the 38 States, and the area covered by these fires was 2,853,170 acres of forest land and 1,575,330 acres of non-forest land. Many times this number of fires burned on State and private land receiving no systematic protection, and extension of protection to the 179,000,000 acres which was unprotected in 1928 represents the major part of the job ahead.

The Federal part in these programs is handled by the Forest Service through five District Forest Inspectors in the East with headquarters at Amherst, Massachusetts; Washington, D. C.; Asheville, North Carolina; New Orleans, Louisiana; and Louisville, Kentucky; and through the National Forest District headquarters in the Lake States and in the West. Plans and budgets for the several projects are jointly considered by the cooperating agencies and expenditures systematically reported and checked. The Forest Service officers connected with the project bring the experience of one State or region to the assistance of another State or region, for the purpose of standardizing practice in the interest of nation-wide protection.

Progress in cooperative forest fire protection is roughly indicated by the following record of expenditures:

	<u>Calendar</u> <u>Year 1911</u>	<u>Calendar</u> <u>Year 1928</u>
Total cooperative expenditures	\$ 257,000	\$4,669,000
State and private expenditures	220,000	3,296,000
Federal Expenditures	37,000	1,256,000
Number of States cooperating	11	38
Area, State and private, protected (acres)	61,000,000	235,000,000

FOREST SERVICE (Continued)

The allotments to the States are based upon two things, the estimated cost of the job in each case and the extent to which the job is being done. Table No. 1 shows the Federal allotments for the fiscal year 1930.

Federal expenditures are made in form of reimbursements to States for the Federal Government's pro rata share of budgeted expenditures incurred.

Forest Taxation Inquiry. The taxation of forest property in various regions of the United States is being investigated to ascertain the effect of existing methods of taxation upon the utilization of land for timber production, and of devising methods which will enable forest land to be utilized by private owners, and at the same time to contribute its just share of local tax revenues. The work is carried on chiefly in cooperation with State and other local agencies. Studies have been completed or are under way in Minnesota, Wisconsin, Michigan, Washington, Oregon, and New Hampshire. The staff of the Inquiry is now engaged in compiling and analyzing the data collected in these States. The tentative conclusions on the most desirable form or forms of taxation reached as a result of this analysis will be checked by further studies in other States, several of which have requested that similar studies be made. The Inquiry has issued four progress reports, including a comprehensive digest of the laws relating to forest taxation in all of the States.

Forest Insurance. The purpose of this project is to develop the facts upon which a workable system of forest insurance can be based and to devise practical plans for insuring forests. An appropriation became available on July 1. The work is being started with an analysis of forest fire statistics in the principal forest regions, for the purpose of ascertaining the relative hazards under various sets of conditions. This analysis will furnish a basis for the classification and rating of risks and give a broad national background for detailed regional work which will follow. The first region to be studied will be Oregon and Washington, under the Pacific Northwest Forest Experiment Station.

The distribution of the Budget figure of \$1,700,000 in the fiscal year 1931 will be as follows:

Payments to States	\$1,535,000
Administration and supervision	85,000
Forest taxation inquiry	70,000
Timber insurance	10,000
	<hr/> \$1,700,000

Table No. 1

Effect of Increase of \$300,000 in Federal Appropriation F.Y. 1931
for Forest Fire Cooperation under Sec. 2 of the C-M Law

State	Estimated cost to pro- tect State & private forest land	Funds budgeted for protection F.Y. 1930 all sources	Federal allotments F.Y. 1930	Distribution of increase proposed for F.Y. 1931	Indicated total Federal allotments F.Y. 1931
Maine	450,000	376,434	52,265	9,255	66,321
N. H.	134,300	70,498	16,852	3,749	22,209
Vt.	78,800	20,544	7,694	474	8,808
Mass.	170,700	111,627	28,627	10,434	42,109
R.I.	14,400	12,034	1,886	464	2,533
Conn.	60,000	62,792	10,932	4,352	15,000
N. Y.	388,500	337,061	63,511	22,456	92,676
N. J.	82,400	118,829	19,712	9,673	20,600
Penn.	393,500	275,651	49,351	10,963	65,021
Del.	9,000	2,567	919	86	1,083
Md.	66,000	47,650	9,929	3,138	14,087
Va.	364,600	74,645	32,814	-	35,375
W. Va.	192,500	91,100	22,733	4,255	29,094
N. C.	487,500	136,864	44,757	693	48,997
S. C.	225,000	52,531	20,250	-	21,830
Ga.	450,000	161,468	40,664	129	43,977
Fla.	411,300	105,101	37,017	-	39,906
Ala.	450,000	85,520	42,090	1,251	46,723
Miss.	383,000	73,245	35,656	933	39,443
La.	342,200	128,971	40,930	7,971	52,717
Texas	359,200	84,323	32,661	262	35,492
Okla.	160,000	33,943	14,429	23	15,580
Ark.	461,250	-	-	-	-
Ohio	27,800	23,340	5,315	2,213	6,950
Ind.	20,000	3,400	1,700	-	1,833
Ill.	10,000	22,809	2,179	1,006	2,500
Ky.	225,000	28,660	14,330	-	15,448
Tenn.	250,000	49,707	23,619	880	26,411
Mo.	260,000	18,250	8,000	-	8,624
Mich.	501,100	472,734	79,380	26,968	114,648
Wisc.	320,900	148,987	37,987	7,163	48,674
Minn.	655,800	419,416	83,798	19,490	111,349
S. Dak.	1,500	4,442	375	626	375
Mont.	195,500	92,760	25,879	6,517	34,924
Ida.(N)	350,000	357,465	57,490	20,445	84,017
Ida.(S)	34,800	19,900	4,900	1,391	6,782
Wash.	425,000	470,076	90,389	41,016	106,250
Oregon	410,500	372,958	83,575	36,682	102,625
Calif.	405,000	624,212	90,427	42,461	101,250
N. Mex.	18,900	7,193	2,181	378	2,759
Total	\$10,245,950	\$5,599,707	\$1,237,203	\$297,797	\$1,535,000

Administration and inspection	85,000
Forest taxation inquiry	70,000
Insurance project	10,000
Total appropriation indicated	\$1,700,000

FOREST SERVICE (Continued)(q) COOPERATIVE DISTRIBUTION OF FOREST PLANTING STOCK

Appropriation, 1930	\$83,000
Budget, 1931	93,000
Increase	<u>\$10,000</u>

\$10,000 to increase the allotments to the States. Federal funds are distributed to the States in allotments of \$2,000 to each State which can qualify for that amount. There are now 40 cooperating States. It is anticipated that in the fiscal year 1931 at least five new States; Illinois, South Dakota, Texas, Nevada and Arkansas, will be added. The increase will be used in taking care of these States and in bringing the allotments of other States up to the amount of the regular \$2,000 allotment.

Project	<u>Project Statement</u>		<u>Estimated</u> <u>1931</u>	<u>Increase</u>
	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>		
Cooperation with States in the procurement, production, and distribution of forest-tree seeds and plants in establishing windbreaks, shelter belts, and farm woodlots upon denuded or nonforested lands,	\$75,188	\$83,000	\$93,000	\$10,000

Activities under this AppropriationProduction and Distribution of Forest Planting Stock to Farmers.

The Forest Service is now cooperating in 40 State projects which are producing and distributing approximately 30 million trees per year for the planting of approximately 30,000 acres of waste land on farms, and for the establishment of farm windbreaks and shelter belts. This stock is furnished to the farmer at a low cost. This represents direct action aimed at the profitable utilization of farm lands which are sub-marginal for agricultural use. In these projects, just as in the fire cooperation projects, the work is administered directly by the State agencies, and the Forest Service inspects, advises and correlates.

The projects for the fiscal year 1930 to date, are supported by \$317,190 of State money and \$73,762 of Federal money, making a total of \$390,972 as shown on Table No. 2, (which follows). Two additional State projects, Mississippi and Utah, have been undertaken since this table was compiled. In addition to these projects in which the distribution of trees is limited to that for farmers, a still larger sum is set up by the States for distribution to others than farmers for the reforestation of forest lands, not a part of these projects.

FOREST SERVICE (Continued)

Table No. 2

FUNDS BUDGETED BY STATES AND TERRITORIES FOR
COOPERATIVE DISTRIBUTION OF FOREST PLANTING STOCK TO FARMERS
UNDER SEC. 4, CLARKE-McNARY LAW, FISCAL YEAR 1930

State	Total State funds	State funds devoted to project	% Total output to farmers	Federal allot- ment	Total
Maine	\$ 1,500.00	\$ 1,500.00	100	\$ 1,500	\$ 3,000.00
New Hampshire	12,862.50	5,431.25	50	2,000	7,431.25
Vermont	20,000.00	9,000.00	50	2,000	11,000.00
Massachusetts	38,000.00	8,000.00	25	2,000	10,000.00
Connecticut	4,000.00	2,000.00	66.6	2,000	4,000.00
New York	285,550.00	141,775.00	50	2,000	143,775.00
New Jersey	19,600.00	13,120.00	70	2,000	15,120.00
Pennsylvania	45,752.00	21,876.00	50	2,000	23,876.00
Delaware	4,200.00	2,030.00	65	2,000	4,030.00
Maryland	7,761.00	2,880.50	50	2,000	4,880.50
Virginia	3,702.00	2,561.60	80	2,000	4,561.60
West Virginia	1,500.00	1,500.00	100	1,500	3,000.00
North Carolina	9,214.00	3,607.00	50	2,000	5,607.00
South Carolina	2,686.00	2,686.00	100	2,000	4,686.00
Georgia	2,000.00	2,000.00	100	2,000	4,000.00
Florida	2,248.00	1,527.00	80	1,357	2,884.00
Alabama	3,100.00	2,080.00	80	2,000	4,080.00
Louisiana	15,041.00	2,260.25	25	2,000	4,260.25
Oklahoma	3,305.00	3,305.00	100	2,000	5,305.00
Ohio	16,500.00	7,250.00	50	2,000	9,250.00
Indiana	6,448.00	3,237.76	62	2,000	5,237.76
Iowa	3,000.00	2,000.00	80	2,000	4,000.00
Missouri	1,800.00	1,800.00	100	1,800	3,600.00
Kentucky	5,000.00	2,666.67	66.6	2,000	4,666.67
Tennessee	2,000.00	2,000.00	100	2,000	4,000.00
Porto Rico	14,600.00	9,620.00	70	2,000	11,620.00
Montana	7,000.00	2,500.00	50	2,000	4,500.00
Idaho	6,300.00	900.00	25	900	1,800.00
North Dakota	7,200.00	4,900.00	75	2,000	6,900.00
Kansas	10,000.00	4,000.00	50	2,000	6,000.00
Nebraska	9,175.00	9,175.00	100	2,000	11,175.00
Colorado	2,155.00	2,155.00	100	2,000	4,155.00
Wyoming	1,948.00	1,948.00	100	1,948	3,896.00
California	12,487.00	797.00	12	797	1,594.00
Hawaii	40,380.00	22,156.60	57	2,000	24,156.60
Washington	3,663.32	1,984.32	70	1,980	3,964.32
Oregon	2,000.00	2,000.00	100	2,000	4,000.00
Michigan	6,077.00	4,865.45	85	2,000	6,865.45
Wisconsin	9,700.00	2,095.00	35	2,000	4,095.00
Totals	\$649,354.82	\$317,190.40		\$73,782	\$390,972.40

Administration

3,990

Contingent for allot-
ments to new States

5,228

Total appropriation

\$83,000

(r) ACQUISITION OF ADDITIONAL FOREST LANDS

Appropriation, 1930\$2,000,000
 Budget, 1931\$2,000,000

<u>Project</u>	<u>Project Statement</u>		
	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>
Examination and purchase of additional forest lands at headwaters of navigable streams	\$1,000,000	\$2,000,000	\$2,000,000

Activities under this Appropriation

1. Determination by the Forest Service and the Geological Survey of the acres meeting the provisions of the applicable laws.
2. Establishment of local organizations to conduct purchase work.
3. Determination of land ownerships, values, etc.
4. Receipt of proposals of sale; examination, cruise and appraisal of lands, preparation of reports.
5. Presentation of cases for consideration of National Forest Reservation Commission.
6. Surveys of lands approved by Commission.
7. Title examinations, preparation of records of title, institution of condemnation proceedings, presentation of cases for approval by Attorney General.
8. Cash payments to vendors for lands vested in United States.

Work now being conducted in the States of Alabama, Arkansas, Florida, Georgia, Louisiana, Maine, Michigan, Minnesota, New Hampshire, North Carolina, Pennsylvania, South Carolina, Tennessee, Vermont, Virginia, West Virginia and Wisconsin.

Within the States named, 35 Purchase Areas have been authorized by the National Forest Reservation Commission. These contain a gross area of 13,917,089 acres; of which 12,411,536 acres is believed to be chiefly valuable for forest purposes, and suitable for administration as National Forests. Of this area, 5,868,919 acres is, or is in process of becoming, National Forest land. The lands reserved from the unappropriated public domain, or acquired by transfer from other Departments aggregate 2,263,734 acres. The lands purchased or in process of purchase total 3,605,185 acres. The additional lands needed to consolidate the areas in Federal ownership and carry out the purposes of the law total approximately 6,500,000 acres.

FOREST SERVICE(Continued)Purchase of Lands Under Weeks Law and Clarke-McNary Law to June 30, 1929.

	Acreage		Average Cost per Acre	Total Valuation
Approved F.Y. 1929 --	464,208	---	\$3.85	\$1,786,461.15
Acquired F.Y. 1929 --	189,675	---	4.70	892,009.85
Total acquired --	2,996,234	---	5.11	15,306,420.80
Total approved --	3,605,185	---	4.91	17,703,394.11

The foregoing statements of cost relate only to the prices paid for the land and are exclusive of the costs of acquisition. For the 3,605,185 acres approved to date (charging to that area the costs incident to cases which failed of consummation), the average cost per acre of the various purchase activities has been:

Examinations by U. S. Geological Survey	2.1 cents
Overhead Supervision	9.3 "
Field Examinations and Appraisals.....	17.6 "
Surveys of Approved Lands	36.2 "
Title Examinations and Adjustments.....	25.8 "
Total Average per Acre.....	91.0 cents

Until recently the majority of the purchases were made in regions where no public surveys exist, and where difficult metes and bounds surveys must be made of each tract to correctly determine boundaries and areas. Titles go back to royal grants, and through the years have been subject to many clouds, adverse possessions, tax sales, etc., so that amicable condemnation proceedings are required in many cases to secure titles which the Attorney General will approve. As the work extends into new regions covered by public land surveys, and where chains of title are shorter and less complicated, the costs of purchase per acre will diminish substantially.

To cover the costs of purchase, the Secretary of Agriculture allocates to the Forester and to the Solicitor the estimated sums required to carry on their activities throughout the year. The remainder of the appropriation is not allocated to regions, States or administrative units, but is handled as a lump sum from which to purchase the offered lands found to be most desirable to carry out the purpose of the law and tendered under price and other conditions most favorable to the United States; on which bases their acquisition is approved by the National Forest Reservation Commission.

Changes in Language

The words "at headwaters of navigable streams, to be expended" have been stricken out of the appropriation item.

As at present worded, this item provides for the acquisition of additional lands at headwaters of navigable streams,***. This language

FOREST SERVICE (Continued)

is applicable to Section 3 of the Act approved March 1, 1911 (36 Stat., 961), which authorizes appropriations for the purchase of lands "located on the headwaters of navigable streams", but it does not give cognizance to the provisions of Section 6 of the Act approved June 7, 1924 (43 Stat., 653), which authorizes the purchase of lands "within the watersheds of navigable streams as in his (the Secretary of Agriculture's) judgment may be necessary to the regulation of the flow of navigable streams or for the production of timber", this latter act being amendatory of the Act of March 1, 1911. The change in language therefore is for the purpose of including the broader provisions of the amendatory Act of June 7, 1924.

The following proviso has been added to the appropriation item:

"subject to the provisions of the Act of April 30, 1928
(45 Stat., p. 468)"

The Woodruff-McNary Act authorizing appropriations in the fiscal years 1929, 1930 and 1931, contains the following:

"Provided, That, except for the protection of the headwaters of navigable streams or the control and reduction of floods therein, no lands shall be purchased under the appropriations herein authorized in excess of one million acres in any one State."

This change in language in the appropriation item has been made to make clear the fact that the appropriation is subject to the limitation contained in the Woodruff-McNary Act.

PERMANENT AND INDEFINITE APPROPRIATIONS AND SPECIAL FUNDS

(s) REFUNDS TO DEPOSITORS, EXCESS OF DEPOSITS,
NATIONAL FOREST FUND

Appropriation, 1930	\$75,000
Budget, 1931	75,000

FOREST SERVICE (Continued)Project Statement

<u>Project</u>	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>
Refunds to depositors of moneys deposited in excess of amounts actually due, and to claimants of sums erroneously collected for the use of lands or for sale of timber or other resources.....	\$81,176	\$75,000	\$75,000

All money received, by or on account of the Forest Service for timber, or from any other source of forest-reservation revenue, is covered into the Treasury of the United States as a miscellaneous receipt; and there is appropriated so much as may be necessary to make refunds to depositors of money deposited by them in excess of amounts found actually due from them to the United States, and so much as may be necessary to refund to the rightful claimants such sums as may be found to have been erroneously collected for the use of lands, or for timber or other resources sold from lands located within, but not a part of, the national forests, or for alleged illegal acts done upon such lands, which acts are subsequently found to have been proper and legal.

(t) NATIONAL FOREST RESERVATION COMMISSION

Appropriation, 1930	\$500
Budget, 1931	500

Project Statement

<u>Project</u>	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>
Expenses of National Forest Reservation Commission and its members	\$500	\$500	\$500

A sum sufficient to pay the necessary expenses of the commission and its members, not to exceed an annual expenditure of \$25,000, has been appropriated, to be paid out on the audit and order of the president of the commission, which audit and order is conclusive and binding upon all departments as to the correctness of the accounts of the commission.

(u) PAYMENTS TO STATES AND TERRITORIES FROM THE NATIONAL FOREST FUND

Appropriation, 1930	\$1,400,000
Budget, 1931	1,600,000
Increase.....	\$ 200,000

FOREST SERVICE (Continued)

This increase in appropriation is made, since it is estimated that the amount which will actually be expended in 1931 will be in the neighborhood of \$1,600,000.

Project Statement

<u>Project</u>	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>	<u>Increase</u>
Payments of 25% of national forest receipts to States in which national forests are situated.....	\$1,351,280	\$1,564,640	\$1,600,000	\$200,000

Twenty-five per cent of all money received from each national forest during any fiscal year is paid at the end thereof by the Secretary of the Treasury to the State or Territory in which the national forest is situated, to be expended as the State or Territorial legislature may prescribe for the benefit of the public schools and public roads of the county or counties in which the national forest is situated. When any national forest is in more than one State or Territory or county, the distributive share to each from the proceeds of the forest is proportionate to its area therein.

(v) COOPERATIVE WORK, FOREST SERVICE

Appropriation, 1930	\$1,400,000
Budget, 1931	<u>1,700,000</u>
Increase	\$ <u>300,000</u>

The appropriation is increased because it is estimated that expenditures from moneys deposited by outsiders will be in the neighborhood of \$1,700,000 in 1931.

Project Statement

<u>Project</u>	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>	<u>Increase</u>
Construction of roads, trails, fences, and other improvements paid for from funds deposited to the credit of the Forest Service by co-operators	\$1,253,166	\$ 834,949	\$1,134,940	\$300,000
Maintenance of roads, trails, fences, and other improvements paid for from funds deposited to the credit of the Forest Service by co-operators	62,377	65,000	65,000	

FOREST SERVICE (Continued)

<u>Project</u>	<u>Project Statement (Continued)</u>			<u>Increase</u>
	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>	
Prevention and suppression of forest fires on private lands within or adjacent to the exterior boundaries of national forests paid for from funds deposited to the credit of the Forest Service by owners of such lands.....	238,999	239,551	239,551	-
Disposal of brush and other debris resulting from cutting operations in sales of national forest timber paid for from funds deposited to the credit of the Forest Service by timber purchasers.....	162,153	162,000	162,000	-
Forest investigations paid for from funds deposited to the credit of the Forest Service by cooperators.....	81,957	82,000	82,000	-
Refunds to cooperators	16,567	16,500	16,500	-
Total	\$1,815,219	\$1,400,000	\$1,700,000	\$300,000

All moneys received as contributions toward cooperative work in forest investigations, or the protection and improvement of the national forests, including deposits received from timber purchasers to cover the cost to the United States of disposing of brush and other debris resulting from cutting operations in sales of national forest timber, are covered into the Treasury of the United States and constitute a special fund, which is appropriated and made available until expended as the Secretary of Agriculture may direct, for the payment of the expenses of the investigations, protection, or improvements of the Forest Service, and for refunds to the contributors of amounts paid in by them in excess of their share of the cost of investigations, protection, or improvements.

(w) PAYMENTS TO SCHOOL FUNDS, ARIZONA AND
NEW MEXICO; NATIONAL FORESTS FUND

Appropriation, 1930\$40,000
 Budget, 1931 40,000

<u>Project</u>	<u>Project Statement</u>		
	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>
Payments to the common school funds of Arizona and New Mexico on account of receipts from state lands administered as parts of national forests....	\$35,855	\$41,243	\$40,000

FOREST SERVICE (Continued)

At the close of each fiscal year there is paid by the Secretary of the Treasury to each of these two States, as income for its common-school fund, such proportion of the gross proceeds of all the national forests within the State as the area of lands granted to the State for school purposes within these forest reserves may bear to the total area of all national forests within these States.

(x) ROADS AND TRAILS FOR STATES, NATIONAL FORESTS FUND

Appropriation, 1930	\$530,000
Budget, 1931	600,000
Increase	\$ 70,000

The increase of \$70,000 is made because it is estimated that \$600,000 will be expended in the fiscal year 1931.

Project Statement

<u>Project</u>	<u>Expended</u> <u>1929</u>	<u>Estimated</u> <u>1930</u>	<u>Estimated</u> <u>1931</u>	<u>Increase</u>
Construction and maintenance of roads and trails within the National Forests.....	\$419,179	\$530,000	\$600,000	\$70,000

An additional 10 per cent of all moneys received from national forests during each fiscal year is available at the end thereof, to be expended by the Secretary of Agriculture for the construction and maintenance of roads and trails within the national forests in the States from which such proceeds are derived.

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Note.- Also see Miscellaneous Section for "Forest Roads and Trails."

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For continuation of Explanatory Notes
see Volume 2, containing the notes of the following bureaus

(Pages 278 to 479 , inc.)

Chemistry and Soils	Bureau of Home Economics
Bureau of Entomology	Plant Quar. & Control Admn.
Biological Survey	Grain Futures Administration
Bureau of Public Roads	Food and Drug Administration
Agricultural Economics	Interchange of Appropriations
Miscellaneous (including Road Items)	
Laws	

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